Science and Beyond

Cosmology, Consciousness and Technology in the Indic Traditions



Editors Sangeetha Menon B V Sreekantan Anindya Sinha Philip Clayton R Narasimha



NATIONAL INSTITUTE OF ADVANCED STUDIES Bangalore, India

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Editors' Note

The scientific quest and the spiritual quest are two of the major forces in human history and in the world today. It is vitally important that we understand the similarities, and the differences, between these two powerful drives, which are anchored deep in the human spirit and which may reflect back to us something of the nature of reality. In this spirit, an International Symposium was held at the National Institute of Advanced Studies during 8-11 January, 2003, on "Science and Beyond: Cosmology, Consciousness and Technology in the Indic Traditions". This Symposium was the fourth and last in the series 'Science and the Spiritual Quest II', an international programme of the Center for Theology and the Natural Sciences in Berkeley, California. The primary objective of the Symposium was to promote dialogue among leading scientists on the connections between their scientific work and their religious or spiritual convictions and ideas. It drew together the most distinguished Indian scientists, philosophers and other scholars, as well as their colleagues from the rest of the world.

The programme included short presentations by leading Indian and foreign scientists and philosophers on what is science and what is beyond science for them, a panel discussion, and public lectures by the Nobel Laureate Charles Townes, the British astrophysicist Sir Roger Penrose and the well-known primatologist Jane Goodall. Many different views were presented at the Symposium.

This Volume contains all presentations made at the Symposium, except for a few which the authors could not send within the stipulated time. The papers are classified under five headings. There is also an 'Introduction' and an 'Overview' of the Symposium written by Roddam Narasimha and Philip Clayton respectively. The style of diacritical marks used for Sanskrit words follows the style used by the author, and changes have been made only when essential. In some cases the listing of References and End Notes also follows the method adopted by the author. The papers have been copy-edited.

The Symposium was jointly organised by the National Institute of Advanced Studies and the Sir John Templeton Foundation, and cosponsored by the Infinity Foundation, Indian Council for Philosophical Research, the Center for Studies in Civilizations and Université Interdisciplinairé de Paris. We would like to express our thanks to all of them. We thank Dr Raja Ramanna and Dr Mark Richardson for their remarks at the concluding session. We also thank Ms K Shashikala, Ms V B Mariyammal and Mr G D David for their help in copy-editing.

> Sangeetha Menon B V Sreekantan Anindya Sinha Philip Clayton Roddam Narasimha

17 March, 2004

Editors

RODDAM NARASIMHA National Institute of Advanced Studies

The announcement of the Symposium whose proceedings you now hold in your hands said:

Modern science, mathematics and technology have, during the last three centuries, transformed our understanding of life, nature and the universe, and provided mankind with unprecedented power to control its environment - for good or ill. This extraordinary development, built on older scientific and technological traditions in both East and West, has been so spectacularly successful that it has raised a fundamental question: Is there anything beyond science? For, even as scientific knowledge is increasingly translated into power over the physical world, the very practitioners of that science have often been drawn on a quest beyond it and that quest has often led the seeker to philosophy, religion, spirituality, humanism and other similar paths to an integrative view of life and the universe. If there is something beyond science, what is it - for each of us, and for mankind as a whole?

This is today a central question because science and technology are unveiling radically new possibilities before us – in physical and (increasingly) in living systems as well – possibilities and options that we could not have even conceived of a few decades ago, possibilities that raise questions for which there are no widely accepted answers. Will the vastly enhanced capabilities we have today in communication and information technologies alter our cultures? Will developments in biotechnology raise entirely new ethical issues that we have not even thought of till today? Will the problem of consciousness receive a scientific answer that will set aside all the philosophical speculation that human societies have indulged in for several millennia? Will there

be a 'theory of everything', or are there things out there in the physical world that will for ever remain unknowable? Are there similar things that happen in the brain that will remain for ever incomputable? Will man possess before long the technology that will delay aging, and even perhaps make him immortal? Is there only one universe or are there many? Is there only one kind of knowledge or are there many? Can morality, ethics, human action be based on consensible public knowledge of the kind so characteristic of science? These questions do not cease.

The Symposium, part of the programme on SSQ-II of the Center for Theology and the Natural Sciences in Berkeley, was organized jointly by the National Institute of Advanced Studies and the John Templeton Foundation, with the support of the Infinity Foundation, the Indian Council for Philosophical Research, the Centre for Studies in Civilization and the Université Interdisciplinaire de Paris. A large number of scientists, technologists, philosophers and other scholars, from different parts of the world, gathered at the Institute during 8-11 January 2003 to consider such questions and offer answers as they see them.

As might have been expected, perhaps, no unique answers to these questions emerged from the meeting, but there were nevertheless broad classes of views. In retrospect, it has been very interesting to see where different people agreed and where they did not. In retrospect, too, I find that the Symposium on the whole could not devote enough time to those issues where views did not converge.

It was the intention of the Symposium – the most recent in a series that has travelled through Boston, Paris and Tokyo – that there should be an emphasis on Indic traditions, particularly in cosmology, consciousness and technology. It therefore seems appropriate to ask about the kind of Indic views that emerged in the Symposium. There is, of course, no single Indic view in many of these matters; today as in the past Indian thinking is richly diverse and pluralist. Nevertheless some broad similarities in approach could I believe be discerned. But before we get to that question, it is necessary to sketch the structure of the discussions and exchanges that took place. They began with technology (and kept coming back to it). Then there was the issue of science (making now a necessary distinction from technology), and the extent of its intellectual reach. Does that reach include human consciousness,

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religion and spirituality; and if not what are the relations between them? Finally there was the issue of ethics, morality and human action.

* * *

It is easiest to begin with technology, in part because that was how the Symposium itself started, and in part because concerns about it are so widespread.

In his inaugural address, Karan Singh, the distinguished scholar and statesman, already expressed worries about whether humanity could survive its own technological ingenuity. Narayana Murthy, a leader of India's booming software enterprise, spoke at length about the need for values, and for keeping the interests of community in mind. Technology could help enormously in tackling the many serious problems that India faces today – poverty, education, governance, for example – but technology itself does not have a moral dimension: it can be misused. He quoted Einstein, about how only morality in action can give dignity. For the corporate world there is need for a 'protocol' for behaviour that enhances the trust, commitment and enthusiasm of members of the community. In his own company, the most highly regarded value could be summed up in the thought that 'the softest pillow is a clear conscience'.

M S Swaminathan echoed these feelings. He made very specific suggestions about how to erase the technology divide that characterizes today's world, achieve equitable economic development, and protect human diversity. He urged scientists to take responsibility for their work, noting the problem of growing violence in the human heart even as there is great craving for peace.

Anindya Sinha analysed the scientific and ethical issues raised by modern biotechnology, and urged that the challenges posed by cloning of humans, which he considered inevitable, should be squarely faced. An exercise of 'willful rationality' on the part of human beings, and an agreement that it should be left to the individual conscience of the people concerned as long as it does not harm others, was what was needed to tackle these ethical issues that new technologies were throwing up.

Devaki Jain also spoke feelingly about the disparities that characaterise the world of today, and how the ideas of Mahatma

Gandhi can take us beyond science and technology towards a dignified society in the best of the Indic traditions.

Thomas Odhiambo, presenting an important African view, was also concerned about how technology and science were dividing the world. Earmarking some people (say scientists) as *producers* of knowledge and the rest as *consumers* was alien to the African world-view: knowledge is a common product of a dialogue between scholars and experts on the one hand, and the social actors on the other. He thought that the astonishing resilience of African society – following centuries of slave trade and colonial subjugation – may be due to the social connectedness and integration that characterize African society. That connectedness is inter-generational – it includes the *living dead*. He cited recent research which showed how social connectedness – a rich, interactive social environment – was important for maintaining psychological balance.

There thus seemed to be a widely held consensus that technology was powerful, and could be a great source for good; but morality and ethics seemed beyond technology, at least as it is often practised at present. These concerns about technology reflected a larger commitment to the centrality of society and values, and to promoting the quest for healing – a commitment independently of connections with technology that was expressed again and again by many Indian speakers. Even Ravi Kapur's sadhus and sanyasis (full of energy and cheerfulness) had a sense of public service: one of them said he was a man with *'ladoos* in both hands' – he ate from one hand by serving people who came to him, and from the other when he was alone in communion with God.

* * *

If technology, seen by many as a quest for power, is inherently divisive and so needs to be mediated by ethics, what about science, which tends to be seen as a quest for 'truth'? What, if anything, is in broad terms beyond it?

This basic question received widely different answers. There were first of all those who wished to analyse and question the very concept of something being beyond something else. Sundar Sarukkai noted that science resists any attempt to draw boundaries on itself, but nevertheless – paradoxically, it seems to me – also resists incorporation

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of 'external' (!) factors like ethics into scientific activity. It is religion and art as background that may make the boundaries of science stand out in contrast; perhaps, he said, it is the boundary of religion and spirituality that has to be defined. Sangeetha Menon, approaching the problem from the viewpoint of consciousness, considered both science and the spiritual quest as remarkable human experiences; they were coexistent, *beside* each other, rather than one being *beyond* the other.

Others like Vidyanand Nanjundiah (and Prof S K Ramachandra Rao, whose contribution does not appear in this volume) were certain that there was nothing beyond science. C S Unnikrishnan considered that rational enquiry was itself the ultimate spiritual quest, and seemed to imply that there was nothing beyond.

At the other end, M G Narasimhan discussed the possibility that there are limits to scientific knowledge: we do not know if a 'theory of everything' exists, and if it does whether it will be discovered, if discovered whether it will be feasible to test it; there are various 'impossibility theorems' to contend with as well (such as Heisenberg's uncertainty principle and Gödel's incompleteness theorem). '[W]ith each problem which we solve', Narasimhan quoted from Popper, 'we not only discover new and unsolved problems, but we also discover that where we believed we were standing on firm and safe ground, all things are, in truth, insecure and in a state of flux'. The future of science is not clear: we do not know where the limits of science are.

Sharada Srinivasan argued that aesthetic experience lies beyond science, perhaps (- because of its universality) even beyond religion, and takes the celebrated icon of Śiva Naţa-rāja as an evocative symbol of the idea of the ceaseless flow of energy, of a cosmic dynamics of creation and destruction.

Philip Clayton found earlier ideas about a boundary-less science outdated: there are phenomena within the natural world (like consciousness) that point beyond physical or material explanations. We must not be afraid to question hegemonic claims to knowledge, whether from science or from religion. But philosophers and theologians need to learn from science and its methods: testable theories, public data, culture-independence and traceable causal histories, so characteristic of the scientific pursuit, could be useful in the spiritual quest as well.

Indeed, there were many who argued that the scientific and spiritual quests were very similar – Charles Townes most eloquently. The emphases in the two may be different: religion may attempt to understand the purpose and meaning of the universe while science tries to find out how it works. But the striving was similar in both – an idea, he said, that Indic traditions had always accepted. The approach and the methods followed in both are very similar. After all, science itself depends on faith of some kind, such as for example the uniformity of nature, which cannot itself be proved from science. Thomas Odhiambo made the same point, that the basis for science and spirituality is arbitrary.

The other view was that science and spirituality are not identical but in some sense complementary. Swami Bodhananda looked at science and spirituality as two aspects of the same phenomenon, and saw no conflict between them in the Indic tradition. But according to him there is, and always will be, a realm beyond both – an unknown whose boundary with science may keep shifting, but which will nevertheless always remain. Kaarthikeyan similarly saw science and religion as two complementary versions of knowledge for humanity.

Ramnath Cowsik suggested that we need an additional axiom apart from those of science -e.g., one that supports 'positive evolution' (love of humanity, non-violence etc.) - to lead to the creation of a supra-science that bridges the gap between science and spirituality.

Roddam Narasimha considered that the fundamental issue that is likely to remain beyond science is that of human action – at a given point, at a given time. He argued that this was because of differences between private and public knowledge – a question that we shall return to.

* * *

Do the ideas of modern science provide a pointer, if not a bridge? B V Sreekantan described at some length current views of the physics of the universe. Empty space plays a big role in defining ultimate constituents of matter, for vacuum is filled with fields, and particles are only excitations of these fields: there is, as M L Bhaumik put it, a quantum frenzy in those fields. Ideas about the Big Bang, and the consistency with which much of the physical history of the universe after its creation can be described, point to how physics at extremely

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small distances is much like physics at extremely short times after the bang. The theories of unification in physics are emphasizing one-ness: matter and energy, space and time, electricity and magnetism, and developments in string theory that demonstrate striking unification in a ten-dimensional universe, for example. Sreekantan points out how experiments have forced transcendences in the scientist's way of thinking, and quotes Kaku about the emerging *aesthetic* relation between physics, mathematics, religion and philosophy. The ancient Upanishadic texts of India spoke eloquently about one-ness – and their ideas inspired the thinking of Schrödinger about the nature of ultimate reality. Bhaumik similarly pointed out that all fields come close to the concept of immanence in western theology and Brahma in Indic. As John Wheeler said, the observer may be as essential to the creation of the universe as the universe is to the creation of the observer: a thought that sounds familiarly Upanishadic to Indians.

Unnikrishnan echoed these thoughts, but from a different perspective. He pointed out that there is an inherent beyondness within rational scientific enquiry itself. This arises from the use, in scientific theories, of unobservables, the objective reality of which is debatable or indefinite – like potential, phase, vacuum, even time and space; but such *unobservables* occur in theories for *observables*, i.e., for measurable reality. The ideas of substantial amounts of dark matter and dark energy in the universe, and the quantum vacuum containing an infinite amount of energy, seem mystical – and the contemplation of these features of the cosmos can be a spiritually enriching experience. Similarly the issues of quantum entanglement and teleportation, and random initial phases of the unobservable wave function, can have profound metaphysical implications. There may be various other kinds of spiritual experience as well, but rational enquiry, according to him, is perhaps the ultimate spiritual quest.

Ashok Kumar Jain explained the Jain view of the existence of profound and deep-rooted truth in the 'beyond', i.e., not within the reach of physical probes, but accessible to that one sophisticated apparatus that is both physical and spiritual, namely the human being. But this does not mean that the law of cause and effect does not hold. Jain argued the Indic view that there *are* laws governing action: 'life is a field of *karma* where we sow and reap and sow again'. Jain also makes connections between the ideas of quantum mechanics and the Jain seven-fold (*sapta-bhangi*) system of logic.

* * *

Bruno Guiderdoni, speaking as an Islamic cosmologist, made a specific distinction between science and the spiritual quest: the former is about efficient causes, the latter about final causes. But the two are in constant dialogue; as science keeps making spectacular breakthroughs with new observing techniques, recurrent puzzles remain, pointing to the metaphysical structure of reality. The cosmos is apparently finetuned for the appearance of complexity, of human life. As cosmologists try to evacuate 'final' causes, they discover new phenomena but encounter the old puzzle – a point related to Popper's argument about the tension between knowledge and ignorance. There is, thus, a mystery to reality, and God is the name given to that ultimate reality – which will always remain hidden, making scientific descriptions always approximate. The significant difference between the scientific pursuit and the spiritual quest is that the latter is not limited to the intellectual search for truth or the production of useful causes - instead it aims at transforming the human. 'Nobody has been intimately changed by one's scientific knowledge', said Guiderdoni.

Townes also brought up the question of Design: the 18 or so fundamental constants that populate current physical theory have just the values necessary for making our world and life possible. All critical molecules are left-handed. Surely all this cannot be just accident? This apparent 'fine-tuning' of the universe struck many scientists: Sreekantan and Bhaumik also found it extraordinary – something, once again, that could not be sheer accident.

Jean Staune considered some genuine breakthroughs achieved recently in science, and formulates experiments that are in principle doable, and could indicate whether there is design in the universe. In other words, the science-religion dialogue has the potential to produce breakthroughs in our knowledge.

* * *

That takes us to the question of what knowledge is. Ramakrishna Rao noted that only reason and logic seem to bring a division between science and spirituality. In a detailed exposition of Indic views on a wide variety of philosophical issues, he pointed out that for both Hindus and Buddhists awareness-as-such is reality itself. The justification for ultimate knowledge is not a rational argument: critical processes alone cannot give us subjective awareness. He made a distinction between knowing and being, between information which

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answers the question *what it is about*, and meaning which answers the question *what it is like*. But he also emphasized the value of conduct and said that education, for example, had to be value-filled and not merely value-added.

Is there in fact more than one kind of knowledge? B V Sreekantan analysed the distinction between transactional ($vy\bar{a}vah\bar{a}rika$) and transcendental ($p\bar{a}ram\bar{a}rthika$) knowledge. Swami Bodhananda also noted that classical Indian wisdom traditions talk about two kinds of knowledge: $par\bar{a}$ - and $apar\bar{a}$ - $vidy\bar{a}$. There is a public reality that science deals with, and there is a private, independent reality which cannot be negated. Each of these realms of reality is independent – to believe otherwise is to accept some form of reductionism. That is why dialogue is necessary – and we conduct it because man 'choicelessly wants to be immortal' – has an 'uncultivated' desire for immortality. Technology will give us comfort, but we may only be comfortably unhappy. Three levels of discipline (yoga) are, therefore, necessary to tackle the problem: material, mental, spiritual. We will be much poorer if we do not do it simultaneously.

Narasimha also stressed the differences between public and private knowledge, and saw in them the reason why human action may be beyond science, for action depends on both private and public knowledge. While on the latter, science has made extraordinary progress, it remains to this day insufficient to guide right action in a ('moral') crisis. Man is, therefore, compelled to fall back on private knowledge at such times – and that private knowledge is necessarily something that cannot be widely shared or accepted. Transformation of the private knowledge of people, therefore, seemed to hold the key to ensuring that human action serves society. He saw Indic traditions as declaring that such transformation is indeed possible.

* * *

Action, ethics and morality may be beyond science, but (apart from the more general question that Narasimhan raised) is there intellectual truth as well that may be – 'truth' as defined within the framework defined by science itself? The area that got most attention here was consciousness, brain, mind and related questions. According to Roger Penrose all physical behaviour, including in particular human action, is governed by mathematical laws. (That seems to leave no scope for free will, but he believes that there should be no conflict if the

mathematical laws are sufficiently subtle and sophisticated.) His Platonic mathematical world is cyclically connected with the physical and mental worlds, only a small part of the Platonic being involved in the physical etc. There are no mathematical truths that lie in principle outside the potential scope of human understanding, but this understanding cannot be entirely computational. He considers that morality is connected with consciousness and, therefore, that it is very important to have a scientific theory of consciousness.

Animals too have consciousness in Penrose's view, a view which was enthusiastically argued in the meeting by Jane Goodall, and has been traditionally accepted – indeed taken as obvious – by Indians for long. Goodall went on to point out how the chimpanzees she observed in Gombe make and use tools, have a sense of humour, display strong family bonds, dance in the rain, react to the magic of a waterfall the way humans do, and seem to show something like religious behaviour. She thought chimpanzees have a soul like humans, and the place of the human in the animal world has, therefore, to be reassessed. But these are such ancient and widely held beliefs among Indians that they would be puzzled about why these 'discoveries' are being made so late elsewhere.

Penrose also makes a distinction between mind and brain, and, as he says, Indians would generally again agree. But Vidyanand Nanjundiah, in his analysis of the scientific understanding of biology, took the stand that there is no reason to separate mind from brain. He points out that what we call science is behaviour whose goal is 'finding out' – and this behaviour has had strong selective value, i.e., evolutionary advantage. Doing science is possible because we have brains – or minds. Culture would have been impossible without brains, and is not special to humans (I presume Goodall would agree, as would most Indians). Indeed the brain may well be the most complex structure in the entire universe. It is responsible not only for the ability to do abstruse mathematics, but also for inventing mental constructs that have no basis in reality but satisfy our need for explanations: e.g., religion. Ironically irrationality needs advanced brains! – only humans, it seems, can afford unscientific attitudes.

George Ellis asked how it was that only 45,000 genes cover development of the 10^{13} cells in the human body and 10^{11} neurons in the human brain. He then presents a synthesis of neural Darwinism and affective neuroscience. In this picture each developing brain region

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adapts to the body in which it finds itself, through signals provided by primitive emotional functions developed by evolutionary processes in the animal forbears of man. This idea would appear to bring aspects of psychology and ethology within the analytical framework of Darwinian theory.

Prabhakar Vaidya, on the other hand, considered Jung's idea of the 'collective unconscious', shared across the ages and races and accounting for literature, art, even the concept of God. Now that we know that only about one percent of those 45,000 genes is special to human beings, a gradual accumulation and growth of Jung's collective unconscious seems a necessity. Does that suggest a super-soul or a super-consciousness?

There were several other discussions on the possible connections between consciousness, mind, brain and free will. N Kumar juxtaposed free-willed coconsciousness against the will-free cosmos. In the interaction between these, he asked, can consciousness exert any reaction at all on the cosmos, i.e., could it even cause an ever-so-small swerve in the latter, or are the two subject to totally different rules of procedure?

The classical Indic view, expounded by Ramakrishna Rao, sees mind as a subtle form of matter, and consciousness as incorporeal. The mind relates to consciousness on one side and to the external world, objects of cognition and action on the other side. Mind is physical like brain but unlike consciousness, and non-local like consciousness but unlike brain. As critical processes alone cannot give us subjective awareness, things-in-themselves will for ever remain unknown. I cannot help making a connection here with what may be called Vedic doubt. This is reflected in the celebrated Rg-vedic Song of Creation with which Karan Singh inaugurated the meeting – and which several other speakers kept citing at various later times. The last few lines of this Song, in J. Muir's translation, reads:

> Who knows, who ever told, from when this vast creation rose?
> No gods had then been born – who then can e'er the truth disclose?
> Whence sprang this world, and whether framed by hand divine or no –
> Its Lord in heaven alone can tell, if even he can show.

Rao was certain that consciousness has no direct influence on physical things, and this is in fact why no physical law is violated; so his answer to Kumar's query would appear to be that the 'ever-so-small swerve' is just not there. The universal values of truth, beauty, goodness may have origins in an intuitive awareness of truth, but while their genesis is intuitive they need validation by science and evaluation by criticism. The justification for seeking *moksa* ('that which makes one perfect') in Indian thinking is not rational argument but empirical evidence: persons who have attained *moksa* actually exist in real life.

But the question that remains in the end is about conduct, and whether that is intuitive too. Rao's conclusions once again echoed the concerns about human action, society, ethics and morality that were so frequently expressed by Indian speakers throughout the meeting.

* * *

As the SSQ programme has encouraged encounters between different civilizations of the world, we can ask whether there are any differences between Indic and Western views. This issue was considered in great detail by two Indian speakers, who saw both similarities and differences. Ramakrishna Rao saw East and West as complementary. This view is based on the distinction he draws between knowing (which we recall has to do with information and strives to answer the question *what it is about*), and *being* (which has to do with meaning and strives to answer the question what it is like). According to him, Indian thinking concerns itself more with being than with knowing, whereas Western thinking concerns itself with knowing, with no great attention to values. As far as I could see this view was not challenged at the meeting, but, of course, this does not mean that it was accepted. But the idea that in the East transformation of the person was the ultimate goal was echoed by many participants: by Narasimha about Hinduism, by Guiderdoni about Islam.

In his provocative and incisive presentation, Rajiv Malhotra made a comparison between the Indic and the Abrahamic traditions, which, he pointed out, arrived at their understanding of ultimate reality by different ways. Indic methods rely on first-person empiricism (as Ramakrishna Rao also pointed out). They therefore consider that ultimate reality can be reached through discoveries that are accessible to human beings: that is Indic *adhyātma vidyā* implies that every human has a potential to experience the state claimed by *rsis* for

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example, even if that potential is only rarely achieved. The process therefore is ahistorical. Abrahamic religions on the other hand appear to be contingent upon a particular account of history, and grand narratives of God's interventions – unique in space and time. Malhotra realized that these are broad generalizations, and both traditions have exceptions: Miester Eckhart and the Sufi saints share characteristics with Indic mystics; and the recent rise of the Hindutva movement in India, with its focus on Rama's birth place, is an example of a historycentrism that is a departure from Indic tradition. He goes on to present a detailed analysis of the Indic notions of *bhakti* and aesthetic experience (for example through dance and music) which has transcended ordinary human limits, and on how ethics is inseparable form epistemology. Indic views of other issues are analysed by contrasting history and *itihāsa*, theology and *adhyātma vidyā*, religion and *dharma*.

One thread that connected many of the Indian presentations was the centrality of pluralism, and the related point of wisdom being basically collective. S Settar made a detailed analysis of two instances of such collective wisdom, both from South Indian literature. This preference for pluralism was remarked upon in many other presentations as well. Malhotra talked about how there are many Ramayanas in India, and about the country's vibrant spiritual market place. Devaki Jain wanted to avoid boxing the world into Hindu, Muslim, Christian etc. Narasimha noted how in the Indic tradition no trust was placed on a single individual or a single scripture, but rather on the path indicated by a collectivity of great men.

* * *

In the final analysis it seems to me that there were large overlaps in the thinking of the different religious traditions: Hindu, Islamic, Christian, Jain etc., but in each the emphasis tends to be different. Among Indic views expressed at the meeting (some of them undoubtedly shared by others), there appear to be two strands, one concerned with society, values, ethics, morality, action – in brief, *dharma*; another concerns consciousness, mind, *ātman*, *Brahman*. Curiously, the word *dharma* was not too frequently mentioned at the meeting, but I have the distinct impression that that was the concept, hovering unheard in the auditorium but keenly felt, underlying the widely expressed concerns about technology, violence, society etc. (After all *dharma* is literally what supports – supports society,

mankind, life.) Generally speaking, no conflict between science and religion was seen; the unstated assumption was that the scientific enterprise was a natural part of the quest for knowledge.

Many Indian speakers quoted Einstein and Gandhi again and again; perhaps these two names are iconic symbols for knowledge and action, both respected for the way in which they severally sought to combine the two in their lives.

In the Western views presented at the meeting (again shared by several Indian participants), on the other hand, there was considerable emphasis on understanding, knowing the possible physical basis behind consciousness and the relation between consciousness, morality and ethics. And there was a strong undercurrent of opinion favouring the view that the scientific and spiritual quests are similar, and the latter is not beyond the former. These are in some sense complementary to Indic views and need to be understood as such.

The importance of transforming humans found mention in many discussions. Narasimha saw that as the one way in which personal, moral or social crises could be resolved. So did Rao and Guiderdoni. If (as Ellis said) emotions underlie rationality, we see that transforming humans becomes a major goal. Surely that was Mahatma Gandhi's great achievement in 20th century India.

But, most importantly, the Symposium helped scientists and philosophers from different traditions to get together, and the views that were expressed have led to the sharpening of some questions. The most significant outcome of the meeting may have been that a large number of the serious scientists who had been present went away with the conviction that there were bigger questions about science than the ones that they love to tackle in their laboratories and offices. I hope that once this volume is read by the participants of the meeting as well as others, it will be possible to focus on a small number of crucial issues (of the kind mentioned at the beginning of this essay) to understand the view points of the different cultures. Perhaps, as Philip Clayton said, in another meeting at NIAS!

Inaugural Address

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As this Symposium begins with cosmology, I would like to start my address by quoting the famous creation-hymn from the world's most ancient living scripture, the Rg Veda (X.129/1-7 - Griffith translation):

Then was not non-existent nor existent: There was no realm of air, no sky beyond it: What covered it, and where? And what gave shelter? Was water there, unfathomed depth of water?

Death was not then, nor was there aught immortal: No sign was there, the day's and night's divider. That One thing, breathless, breathed by its own nature: Apart from it was nothing whatsoever.

Darkness there was: at first concealed in darkness this All was indiscriminate chaos. All that existed then was void and formless: by the great power of Warmth was born that Unit.

Thereafter rose Desire in the beginning, Desire the primal seed and germ of Spirit. Sages who searched with their hearts' thought discovered the existent's kinship with the non-existent.

Transversely was their severing line extended: what was above it then, and what below it? There were begetters, there were mighty forces, free action here and energy up yonder.

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Who verily knows and who can here declare it, Whence it was born and whence comes this creation? The gods are later than the world's production, who knows then whence it first came into being?

He, the first origin of this creation, Whether he formed it all or did not form it, Whose eye controls this world in highest heaven, He verily knows it, or perhaps he knows not.

It is indeed astounding that modern developments in science, particularly cosmology, seem to echo some of the insights of our great seers and sages, which have come down to us for thousands of years through the long and tortuous corridors of time. It is almost as if, like the background emanations from the Big Bang, the faint echoes of our ancient spiritual luminaries can still be heard in the background of all our post-modern discourses on the human condition.

Some years ago, when I was Ambassador to the United States, I called upon the great scientist, Prof. S Chandrasekhar, in Chicago, and asked him as to how it was that the seers of the Vedas and Upanishads had two astounding insights which have emerged in modern science only very recently. The first is the concept of *Anantakoti Brahmånda* – billions of galaxies or universes. The second is the concept of vast aeons of times through which creation passes, a single day of Brahmå being 4.32 million years with a night of equal duration, so that a year of Brahmå closely approximates the age of planet earth. He really had no explanation and when I suggested that, perhaps, this knowledge came to our seers in enhanced states of consciousness, he said that was quite possible.

From cosmology, let us then move on to consciousness. In the Indic traditions, consciousness is not merely an epi-phenomenon of evolving matter, rather it is the prime principle, which calls forth these millions of worlds. The great icon of Siva Nataraja, Lord of the Cosmic Dance, beautifully portrays this kinetic universe in which all things, from the majestic movement of the great galaxies down to the persistent agitation of sub-atomic particles, are in a state of flux. The drum in Siva's left hand represents creation – the original Big Bang, if you like, or, perhaps, a continual series of Big Bangs, while the fire in his right hand represents their ultimate destruction in the great cycles of time. However, if there were only the Big Bangs and the Big Crunches,

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there would be little space for you and me. Siva's other two hands, therefore, point to the possibility of individual realisation amidst the cosmic chaos in which we find ourselves. One hand is raised in a gesture of benediction, telling humanity not to fear, while the fourth points to his upraised foot as the path of liberation.

The whole question of consciousness and its evolution is one that has attracted some of the best minds in the world, including the great evolutionary philosopher, Sri Aurobindo. In India, we have developed over the millenia, systems of *Yoga* which are surely the most profound and integral exploration of consciousness ever essayed by the human race. While we also developed path-breaking outer technology in such fields as metallurgy, medicine and mathematics; Indian civilisation took a turn probably unique in the history of thought. Our most creative minds turned the searchlight inwards towards the source of Consciousness itself, and built up an entire science based upon this creative introspection. In his classic work on the *Yoga-sutras*, the Sage, Patanjali, has given us a seminal textbook for exploring the deeper recesses of our being.

Post-Freudian movements in psychology in the West have also gradually developed these deeper insights, notably with C.G. Jung and the post-Jungians, and moving on to Transpersonal Psychology. The study of consciousness has now become a fully respectable and challenging area for intellectual and experiential exploration. I have personally had the privilege of discussing the nature of consciousness with some of the most creative minds of the 20th century — Stanislav Grof with his extended cartography of the mind, Rupert Sheldrape with his theory of morphogenic resonance, Ilya Prigogine with his Chaos Theory, Jonas Salk, the great biochemist, whose book, *Survival of the Wisest*, is a classic, Carl Sagan, who brought the mysteries of the cosmos into the minds and hearts of millions, Arthur Clarke, the astonishingly creative space author and many others. Indeed, the study of consciousness is now one of the most fertile fields for research and experimentation.

Years ago, when I was Minister for Health and Family Planning, I had started here in Bangalore in the National Institute of Mental Heath and Neuro-Sciences (NIMHANS), a programme entitled `Project Consciousness' in which I had assembled some of the most creative scientific minds in India, as well as involving Pandit Gopi Krishna, whose books on *Kundalini* awakening are known throughout the world.

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Unfortunately, as so often happens, the project was wound up almost immediately after I left the Ministry, evidently considered a mild eccentricity not worth pursuing. It has always struck me as tragic that we in India, with our unique spiritual and intellectual background in this field, should still be lagging behind. Had the project continued over the last quarter of a century, we could well have produced the first Nobel Laureates in the field of Consciousness research.

Albert Einstein's famous remark that "science without religion is lame, religion without science is blind", makes a very important point. Before him, the Cartesian-Newtonian-Marxist paradigm of thought postulated an unbreachable dichotomy between matter and spirit. This concept dominated Western civilisation for several centuries and did produce spectacular results. However, with the Einsteinian revolution and Heisenberg's uncertainty principle, quantum mechanics and extragalactic cosmology, the situation has now changed considerably. Science itself is in one of its great creative periods where old barriers are breaking down and some of us – perhaps, a trifle optimistically – are beginning to discern the outlines of a convergence between science and spirituality.

I use the term 'spirituality' advisedly, because 'religion' carries a lot of baggage, much of it positive but some of it negative also, despite the work being done by Inter-faith organisations around the world, including the Temple of Understanding of which I happen to be Chairman, whereas spirituality transcends theological divisions, and cuts across barriers of race and creed, religion and nationality. The seers of all the great faiths of the world have, in their utterances, sought to describe what is essentially an indescribable experience, whether it is the Beatific Vision of the Christians, the Bodhicitta of the Buddhists, the Noor-e-Ilahi of the Muslims, the Ek Onkar of the Sikh Gurus or the Self-Realisation of the Hindus. Clearly, there are states of higher consciousness which transcend all barriers and which are the heritage of the entire human race. This flows from the persistent tradition of the light that illuminates the Universe - the light of Consciousness itself, and it is ultimately an awareness of this light in all human beings that alone can become the cornerstone of a sane and harmonious global society.

What is needed today, as the watchword of the emerging global society, is a new global renaissance, an integration between apparently conflicting concepts. We need to develop a benign symbiosis between

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the various elements of our personality – the inner and the outer, the quietist and the activist, the feminine and the masculine – and in the broader dimension, between science and spirituality. It is my sincere hope that this International Symposium on *Science and Beyond* will help to trigger the process of creative symbiosis whereby alone the human race can survive its own technological ingenuity. It is in this hope that I have the greatest pleasure in inaugurating this Symposium.

Science, Technology and Society

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A brave new world... Scientific and ethical issues in human cloning

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Introduction

The last century has witnessed some remarkable scientific advancements in different areas of biology, but few have been as spectacular as those in genetics. It has truly been a roller-coaster ride – first, along the gene and then, almost exactly in the last fifty years, along the DNA molecule – a road full of surprising twists and turns. What is remarkable, however, is that these twists and turns have not only involved our scientific concepts and knowledge – this is but to be expected – but most surprisingly, they have forced us to re-evaluate our perceived value systems, our morality and our spirituality, properties that we hold very dear to us and claim to be uniquely human.

And that is why our scientific endeavours today, particularly in the realm of molecular genetics and recombinant DNA technology, must look beyond science; they must reach out to examine issues that have traditionally been left to philosophers and social scientists to ponder upon. This should not only be in the sense that we have been doing so far – in terms of the influences that reach out from beyond the boundaries of science to illuminate our scientific processes, but, more practically, in terms of the effects that our scientific endeavours themselves have – on the animal spirit and the human psyche. We are no longer scientists working in our everyday ivory towers of science, heedless of the world outside; we are now ordinary people who must be forced to confront the far-reaching implications of our own deeds and actions.

The cloning of humans and other animals

If there is one recent advancement in genetics that best exemplifies the far-reaching effects of our science on the everyday life and thinking of ordinary people, it must surely be the creation of Dolly – the birth of the cloned sheep "Dolly" (Wilmut *et al.* 1997) – an announcement that

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woke the world to the possibility that cloned humans could be just a small step away.

Cloning literally means "to make a copy of", although the American Heritage Dictionary (2000) now, topically enough, defines it as "to make identical copies of (a DNA sequence)" and even "to create or propagate (an organism) from a clone cell: *clone a sheep*"! In general, a clone is a population of genetically identical cells or organisms that originate from a single cell or organism by non-sexual methods; more specifically, human cloning refers to the production of genetically identical humans by the techniques of embryo splitting or somatic cell nuclear transfer.

In embryo splitting, early human embryos are separated into several parts, each developed till the blastocyst or late embryo stage and then implanted *in utero* to allow full-term development into a child. Artificial monozygotic twins can be created in this way. Although very successful in different species, it has been performed only till the preimplantation stage in human beings (Hall *et al.* 1993). Embryo splitting has been ethically considered permissible in certain infertility treatments, but potentially suffers from the problem of low number of successful blastocysts that can be viably produced; it is also to be noted that this procedure cannot generate exact clones of the parents since the original embryo is generated by the normal process of fertilisation *in vitro*.

In somatic cell nuclear transfer, a zygote is constituted by introducing the genetic material of any body cell by microinjection or electrofusion into a developing egg from which its own genetic material has been removed. This zygote can now potentially develop into an embryo that can be implanted to produce a child genetically identical to the donor of the original genetic material.

What is most fascinating about cloning is that, although it does not necessarily produce carbon copies of organisms, genetic engineering and cloning do provide individuals with the opportunity to introduce an element of choice into reproduction. Parents may thus not be able to create duplicates of themselves, but they can, perhaps, create life in their own image.

There are two fundamentally distinct types of human cloning by somatic cell nuclear transfer: therapeutic cloning and reproductive cloning.

Therapeutic cloning

The objective of therapeutic cloning is to produce embryonic stem (ES) cells that are genetically identical to the genetic constitution of a patient. These cells could then be differentiated into different types of tissue precursor cells and injected into the body to treat a variety of degenerative diseases from which the patient might suffer (Gurdon and Colman 1999).

The principal ethical opposition to this form of cloning, in spite of its potential therapeutic importance in the treatment of rare degenerative disorders that otherwise defy any cure, is due to the fact that this procedure uses cloning to create a human embryo and then destroys it to obtain ES cells. Several alternatives have, therefore, been suggested by opponents of this form of research.

Non-cloned ES cells: This procedure is preferred by individuals and groups opposed to any form of human cloning. The problem with ES cells derived from non-cloned, normally-fertilised embryos, is that they would not be genetically identical to the patient and that their application would, therefore, require the use of strong immunosuppressive drugs with their subsequent, often unpleasant, side effects (Gurdon and Colman 1999).

Adult stem cells: These cells have been isolated from the bone marrow and several other tissues of adult individuals and encouraged to proliferate *in vitro*. Various groups have suggested that stem cell research should be applied only to these cells since they do not require either cloning techniques or the destruction of human embryos. However, some of the fundamental disadvantages of adult stem cells are that they are hard to isolate, have restricted proliferation potential, present only a limited range of cell types that these cells can be differentiated into, and conversely, there is a significant lack of identified stem cells for most tissues (McKay 2000).

In vitro dedifferentiated stem cells: These cells, which refer to mature tissue cells derived from adults and coaxed to dedifferentiate *in vitro*, present an ideal situation since they would have all the therapeutic benefits of undifferentiated genetically identical embryonic stem cells without the ethical problem of having to destroy a human embryo. Although there continues to be active ongoing basic research into nuclear re-programming, its applications do not yet appear to be amenable to the technology available today.

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Given the available technology of today, therefore, therapeutic human-cloned ES cells, obtained by transfer of nuclei from adult cells to enucleated eggs, represent the greatest hope currently available for tissue replacement therapy (McKay 2000).

Reproductive cloning

The objective of reproductive cloning is to produce a child genetically identical to one of the parents. A large number of animal species including sheep, cattle, mice, goats and pigs has been reproductively cloned from differentiated cells suggesting that it may not ultimately be very difficult to clone a human being. Although originally suggested as a last resort for infertile couples unable to conceive a child by any other means (Zavos 2001), the possibility of human cloning has raised a host of scientific, religious, ethical and legal questions that have taken the world by storm and led to an immediate ban on human reproductive cloning in many countries.

Interestingly, the majority of scientific opinion is also currently against human reproductive cloning in view of several morphological, physiological and developmental problems exhibited by cloned animals (Jaenisch and Wilmut 2001). Two of the more significant arguments that have been raised are briefly discussed here.

The first problem, that has been encountered, concerns the consistently low efficiency with which reconstituted eggs exhibit further development till the parturition stage. Although typically only about 1% of cloned zygotes reach this stage (Wilmut *et al.* 1997; Wakayama *et al.* 1998), the figure ranges only to a maximum of 3% (Wakayama *et al.* 1998). Large numbers of human eggs would, therefore, be required to generate a single cloned child. This is, however, not an unique problem for reproductive cloning but is also largely true for other human *in vitro* fertilisation (IVF) procedures as well. For one successful pregnancy by certain IVF methods, for example, 10-15 eggs are removed during each ovarian surgery and several such operations may need to be carried out (Elder 2000). Hence, the inefficiency argument against human reproductive cloning is weak, if IVF is considered an acceptable procedure to conceive a human child.

A second important problem that has almost invariably been encountered in mammalian reproductive cloning is that of a high

frequency of developmental abnormalities in various individuals cloned by somatic cell nuclear transfer. Approximately 30-35% of mammalian clones typically suffer from Large Offspring Syndrome (LOS), a syndrome characterised by offspring oversized at birth, with disproportionately large internal organs, as well as a number of respiratory and circulatory disorders (Young *et al.* 1998). Is this applicable to human cloning as well? Will we pay an extremely heavy price in terms of physically and possibly mentally retarded children with low life expectancies if these reproductive cloning techniques are indiscriminately applied to human beings today?

It has, however, been argued in response that problems in animal cloning are largely due to poor culture conditions for most of the species that have been experimented with, while culture conditions have now well been optimised and improved for human embryos and cells over the last many years of IVF and other assisted reproductive technologies (Zavos 2001). Another factor that seems to be responsible for LOS in most mammalian species is the incorrect imprinting of the IGF2R gene (Young et al. 2001), which is not imprinted in humans or other primates (Killian et al. 2001). This is supported by comparative evidence of LOS in humans and nonhuman animals following IVF procedures (Young et al. 1998) as well as empirical evidence that rhesus monkeys cloned from embryonic somatic cells do not exhibit LOS or any other developmental or physiological abnormalities (Meng et al. 1997). Although there is no final word on this matter yet, it is likely that cloned human beings may exhibit much lower frequencies of morphological or physiological abnormalities, evidence for which may be difficult to acquire given the current ethical stringencies associated with such experimental procedures.

The scientific debates in human cloning

Therapeutic cloning

The debate regarding therapeutic human cloning revolves around the therapeutic benefits that could be obtained in the treatment of many congenital degenerative diseases through this form of cloning against the ethical cost of destroying the early cloned embryo. This principally stems from the perception, held by many people, that the early embryo – a ball of cells without even a rudimentary nervous system – should be accorded the status of an individual, given full human rights and its destruction considered equivalent to murder (Shenfield *et al.* 2001).

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However, it must be remembered that, even in a democracy such as India with its diverse value systems, the rights and choices of grown adults supercede the rights of the early embryo. Our society's acceptance and legalisation of abortion is a clear indication of such a stand. It is also illuminating that greater than 70% of the embryos that result from natural sexual reproduction do not implant into the uterus and are ultimately destroyed. Is this mass murder? Given this information, is it possible for us to forfeit natural sexual reproduction?

The ethical considerations thus basically come down to our society's prevalent value systems. A relevant question, for example, would be – which is of greater value, the life of an adult or child dying from a degenerative disease or that of a several-day old embryo, nothing really more than a ball of cells?

Reproductive cloning

The principal scientific debate around human reproductive cloning centres on the right of an infertile individual or couple to reproduce without the interference of any external agency or any legislative body set against the right of the child not to be exposed to an excessively high risk of developmental abnormality. What can be regarded as excessive risk for the child is, however, clearly a subjective decision. It is common knowledge that different potential parents inevitably prepare themselves to take on different levels of risk in conceiving a child in different situations. Again, when the life of a mother is at risk during childbirth, the prevailing ethical system in medical practice gives preference to saving the life of the mother over that of the infant. Even during natural sexual reproduction, the incidence of developmental abnormality in humans is 3% and this rises further when the maternal age is over 40. Yet this is a risk that many parents are willing to take every day.

If then these are decisions that have come to be accepted naturally without excessive ethical debate, there is no reason why human reproductive cloning also cannot be similarly considered. For example, a risk of developmental abnormality and/or perinatal death following human somatic cell nuclear transfer of less than 3% could be considered generally acceptable if this is also the risk of foetal developmental abnormality in natural sexual reproduction. Logically also, if human cloning is banned as a reproductive technique primarily due to the risk to the child, it may become necessary to ban other

currently accepted reproductive techniques that suffer equal or higher risks. Are we willing to give up on IVF and other technology-assisted procedures that many infertile couples presently take recourse to? Moreover, legislation would be difficult since we would also have to ensure that legal steps against reproductive cloning do not necessarily lead to a ban on therapeutic human cloning, a method that uses the same technology to produce cloned embryos, but for medically beneficial purposes.

Ethical debates

Many ethical concerns about human cloning appear to stem from false beliefs about genetic determinism and the nature of individuals that would be produced through cloning. For example, detractors of cloning often portray a scenario of designer babies produced en masse in a baby factory or that of a veritable army of ruthless and remorseless bigots who will reproduce themselves until they have managed to wipe out much of humanity excluding themselves. What must be pointed out here, however, is that a clone will never be an identical copy of an individual - only a delayed identical twin. And just as identical twins are two different people - biologically, psychologically, morally and legally, though not genetically, so would clones be different from each other - in almost every way. To think otherwise would be to encourage a complete belief in genetic determinism - the belief that genes determine everything about us and that environmental factors or random events in human development are completely unimportant in determining what we are. Nothing could be further from the truth. There is, in fact, a growing body of literature that documents the myriad ways in which the environment and stochastic events in development influence pathways and patterns of gene expression.

Another major cause of concern to ethicists is a question of human rights: will cloned humans be treated as commodities, a means to justify the ends of other people? Will they ever be considered equal to naturally conceived individuals? Many of these worries involve the denial of what Joel Feinberg calls "the right to an open future". For example, a child might be constantly compared to the adult from whom he or she was cloned, and thereby burdened with oppressive expectations; in fact, the parents might actually limit the child's opportunities for growth and development. Finally, regardless of his or her parents' conduct or attitudes, a cloned child might be burdened by the *thought* that he or she is a "copy" and not an "original". Would such

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a child's sense of self-worth or individuality or dignity be difficult to sustain? Should we then ban human cloning?

A possible solution to this kind of an ethical dilemma is not difficult to find – especially in a country like India. Let me give an analogy. The child of a poor family can be expected to experience specific hardships and burdens, but we can never argue that such children should never be born. Despite the hardships, poor children do experience parental love and many of the joys of being alive. More generally, no one's life is entirely free of some difficulties or burdens. Is there any justification in believing that a cloned child will have to bear burdens more terrible than a child born by more conventional means? I think not. I believe that, if there is something deeply objectionable about cloning, it will be found only in the reasons that people might have for availing themselves of it. And, clearly, this is something that legislation can never solve. It is a direct question of human choice - a choice that has to be taken up and decided upon individually, under the dictates of individual conscience and personal belief systems.

The debates on social values

Arrayed against these various scientific and ethical concerns about the adverse effects of cloning human beings through somatic cell nuclear transfer are several debates on social values for maintaining individual choice over whether to use the technology. These arguments are made on at least three separate grounds: first, that individual liberty is to be upheld first and foremost; second, that certain actions, such as human reproduction, are particularly personal and should remain free of any external interference; and finally, there should not be any constraints on the freedom of scientific inquiry.

The importance and priority accorded to individual liberty in most democratic societies stem from a general consensus that one of the most important values we share is a commitment to personal autonomy. In part, this commitment is maintained because of the widespread fear that one's own personal choices might get severely constrained, if subject to collective decision making. To the extent that making a personal choice is a form of personal satisfaction, then the means to maximise our collective satisfaction is to make as many personal choices available as possible (Posner 1992). Personal autonomy is also considered valuable in itself, since it is viewed by many as the deepest
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expression of one's individuality and personality, the strongest expression of one's self. Thus, strong arguments have been made that a commitment to individual liberty necessarily requires that individuals be left free to create children using reproductive cloning, if they choose to do so and if their doing so does not cause any significant harm to others (Macklin 1994).

Related to the upholding of individual liberty is the importance of personal choice in procreation and child rearing, a subject that has been briefly mentioned above. Certain actions surely deserve special protection from collective decision making, and human reproduction is often cited as an example. Reproduction is an intensely personal phenomenon that often results in the creation of a parental relationship that can potentially define one's position in the prevailing social fabric of the community. When and how to take on such responsibilities and to change one's life course is obviously one of the most personal and significant decisions imaginable, and should surely be left to pure individual choice.

Another argument made for the freedom to attempt human reproductive cloning focuses on the need to encourage research and scientific advances. The ethical and responsible pursuit of knowledge is one of the inherent values traditionally held in high esteem by the scientific establishment in most democratic systems. Historically, scientific inquiry has been protected and even encouraged because of the great social benefit that is recognised in maintaining the sanctity of knowledge and the value of intellectual freedom. However, the extent to which the pursuit of science must compromise with moral constraints is what is now being intensely debated. Science, however valuable, must obviously observe important moral boundaries - it should not endanger community safety, impinge upon the rights or interests of its human subjects, or inflict unnecessary suffering on animals. How should these values influence basic research on human reproductive cloning and its applications? Coupled to this, of course, is the more specific concern that the methodology of somatic cell nuclear transfer may allow us to combat various degenerative diseases through therapeutic cloning in future and also, perhaps, promote the possible development of other new medical breakthroughs.

Conclusions

In conclusion, I think there is no doubt that humans will be cloned. Scientific and technological progress has shown few signs of halting

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for spiritual or moral objections. Like the birth-control pill, *in vitro* fertilisation, euthanasia or genetic engineering, the technology of cloning will advance, techniques will be improved, and knowledge will be gained. Perhaps, future research will respond to the scientific objections to cloning, but other ethical and religious objections would certainly remain. With our current level of scientific and technological skills, therapeutic human cloning has the greatest medical potential in comparison to its suggested alternatives. Not to pursue this further would be akin to turning our backs on one of the greatest medical advances of our time and condemning millions of people to a premature death or a life of intense misery and suffering. Is this the brave new world we wish to live in?

The inevitable questions that cloning technology will raise – questions about family, rights, and what it means to be human – will definitely challenge society's most deeply cherished and most profound beliefs. But, in my opinion, such a challenge should not be resisted. The difficult questions raised by human cloning can be answered only through a dedicated pursuit of knowledge and an exercise of our willful rationality. Perhaps, it will be most pragmatic to leave many of these acts and decisions, which do not harm others and on which there is no moral consensus, to the individual conscience of the people concerned. For the final solution to the debate over human nature and his actions may simply lie in the fact that the nature of man is nothing if not the product of his own will.

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Quest for healing

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I call my paper a "quest for healing", as I think that, as death and destruction, due to unexpected conflicts, due to violence, and improved technologies of violence, increase there is a quest all over the world for security and, at a deeper level, for peaceful conduct of the business of living in the world. Simultaneously, there is also a seeking for solace, for building reconciliation, by reinvoking spirituality, showing the common basis of all religions, drawing on common consciousness. I was also party to such attempts as can be seen in the book *Speaking of Faith* where we argued that a feminist perspective and ethic affirmed that all religions had a common purpose (Jain and Eck 1986) and thus unity could be forged. The recent research on the human genome showing that we all come from a few cells, is another reference point for claiming oneness.

However, as the demarcation of society and politics shifts from social and economic categories, to religious and cultural categories, there is an anxiety amongst people like Amartya Sen and myself, at this re-invoking of old categories. It takes the world back to the days of the crusaders of medieval times. To the dark ages when bigotry was the limit to which the human imagination could go. Since then, not only the enlightenment in the West, but also the intellectual expression of societies in the 'South' and the 'East' have grown beyond, or extended the boundary of imagination to other categories of stratification and division, such as class, ethnicity, caste, gender, occupation. Nations identify themselves not as Christian and pagan but newly liberated and colonial. Religion as Conqueror was eroded in the 20th Century and there was a sharp fall in attendance in churches, temples, mosques, worldwide. However, many of us suggest, there is a *slide* back (Jain 2002).

Quest for healing

Amartya Sen, referring to the issue of identities and our freedom to choose our affiliations and associations, says, 'This issue has become particularly important in the context of the present political crisis and confrontation, with its ramifications becoming clearer since September 11, (emphasis mine) though the roots of the problem go back much further By categorising the population of the world into those belonging to 'the Islamic world', 'the Christian world', 'the Hindu world', 'the Buddhist world' etc., the divisive power of classificatory priority is implicitly used to place people firmly inside a unique set of rigid boxes. Other divisions (say, between the rich and the poor, between members of different classes and occupations, between people of different politics, between distinct nationalities and residential locations, between language groups etc.) are all submerged by this allegedly pre-eminent way of seeing the differences between people.

Such boxing (my words) '...is potentially a great ethical and political hazard, with far-reaching consequences on human rights'. He then continues, 'I would argue that the main hope of harmony in the contemporary world lies in the plurality of our identities, which cut across each other and work against sharp divisions around one single hardened line of impenetrable division" (Sen 2001).

There is a trend then to argue that we are one, that we need to build unity within diversity, to tolerate; these are the words of advice, of hope-giving that we hear today.

In this paper, I would argue that this is not enough, nor wise. I think it would feed into the enemy's armoury, if I may use military language – of tracing religion, various ethical and spiritual streams flowing out of it, and ethnicity, as the basis of Conflict. Invoking the spiritual, the moral, often linked erroneously with religion and tradition, is also the ammunition which is bringing out the affirmation of old identities to handle the new consumer-based disparities (Patel 2002), and the contradiction between ostensible opportunity provided by the hype on globalisation, and the reality on the ground, where the cookies are only available to the few.

I propose that it is concentration of political power coupled with economic disparities that need to be dismantled or redressed for healing to take place. It is the exclusion from power to redress injustices and perpetuation of disparities in access to the necessities of life that is

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firing the conflict, the hate, the militancy and, for example, the human bomb phenomena. Thus, one can argue that persistent poverty, especially lack of opportunities for what is called work with dignity; inequality perpetuated and enlarged by the effect of visual media; intensification of anger at the inequality; injustice and invasive persecution; accompanied by the carelessness about losing lives in a space where "losing-life" is not such a unique happening, i.e. amongst the very poor, can explain the increasing occurrence of human bombs.

It is important to set the context by looking at some data on disparity. This data appeared in a brilliant paper that was presented by Dr Ismail Serageldin, Director, Alexandria Bibliotheca, Egypt (Serageldin 2002). The figures are very stark.

CHART I: Income/Wealth Disparity

- The wealth of the richest 225 persons is more than that of the poorest 2,500,000,000 (2.5 billion) persons
- The assets of the richest 3 people is more than the combined GDP of the poorest 48 countries
- The assets of the richest 15 people is greater than the total GDP of Sub-Saharan Africa

CHART II: Share in percent

The share of global income going to the richest and poorest 20% of world's population shows that the disparities have increased over time.

| Year | Richest 20% | Poorest 20% | Rich to poor ratio |
|------|-------------|-------------|--------------------|
| 1960 | 70.2 | 2.3 | 30:1 |
| 1970 | 73.9 | 2.3 | 32:1 |
| 1980 | 76.3 | 1.7 | 45:1 |
| 1989 | 82.7 | 1.4 | 59:1 |

There are other gaps too, other than those measured by income. The supposed "knowledge revolution" has also served to accentuate old differences and create new inequalities.

CHART III: Knowledge "have-nots"

| Region | Population | With Internet |
|------------------|------------|---------------|
| Developed World | 15% | 88% |
| Developing World | 85% | 12% |

CHART IV: Patent Ownership

Patents are increasingly being owned by a few. The figures below are illustrative of this.

| Patent Owner | Number of patents granted in US in 1999 | |
|------------------------|---|--|
| IBM Company | 2756 | |
| 134 Countries together | 2643 | |

CHART V: Research Priorities

The interest of the rich too often drives research and technological advancement underlining again the unevenness.



There are other more 'traditional' inequalities too around the world and in India. For example, a look at a map of India that portrays

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the sex-ratio shows up what I call "the blood-stained hands of Mother India" (See Maps)¹. The red patches are where the child sex-ratio, that is of children of age 0-6 year, has fallen by more than 50 points in the 10 years 1991-2001. Earlier, the reds were mainly in Haryana/Punjab and Salem in Tamil Nadu. Now the stains are appearing in other states like Andhra, Gujarat and Maharasthra, where some districts have also shown decrease of fifty points and above in child sex ratio – revealing another Indic tradition, the killing fields for the females of the species. I suggest that this deterioration is also partially due to increasing "pressures" on society, especially families.

The healing touch then is to find a mode for dissolving political and economic inequalities. Beyond science is the reality of political oppression and economic insecurity, the turf of the social scientist. No advancement in science, not the applications to grow food without land, nor finding tablets to substitute for water, or being able to connect various corners of the world via IT, can heal the hunger of the masses, and most of all their consciousness of the Other, i.e. "the haves".

Today the other is being postulated as the Muslim or Hindu or Christian, but the hostility and violence we see, the intolerance, I suggest, comes from the economic "other".

The influence of science and technology and the internet, connecting the NRI and his craving for his cultural identity, driving him into orthodoxy of the most archaic kind in his new country, is feeding into the conservative pockets in his home land, and funding its perpetuation. The uneven fall-out of competition and opportunity, where some of the earlier excluded, such as the minorities and the dalits, are gaining ground in earlier denied territory, in a shrinking space, is inviting retaliation in Gujarat. I suggest that science and technology's hurts cannot be solved by showing the spiritual heights of the mind and preoccupation with that domain.

Putting equality on the ground or reducing inequality is not an easy task nor devoid of morals or politics. The existence of poverty is related to political choices of economic paths, to the tolerance of inequality and injustice. Poverty eradication requires a substantive change in the choice of economic activity, in the quantum of investment in social services, in the economic theory that validates those decisions, and in perceptions of the poor.

Quest for healing

A person who bundled all this together, a social scientist who respected science and technology and religion, but most of all challenged us human beings, was Mahatma Gandhi. One must feel the moral outrage that he felt to eat while others starve, to be clothed when others are naked. There is a beautiful story of how a child living near the Sabarmati Ashram asked Gandhi why he only wore a dhoti and no shirt. The child offered to bring Gandhi a shirt. Gandhi is supposed to have said that he would wear a shirt when all the millions of shirtless Indians could also afford a shirt. Thus the practice of simplicity was in some sense an attempt to emulate or imitate the life of those who did not have enough and thereby release resources to be able to provide for those who did not have enough.

Mahatma Gandhi had the capacity to understand peace building and conflict removal, accommodating the religious and economic programmes. Gandhi's ethic was actually to efface difference through absorption of the other. Symbolic gestures were used with great effect. Inequality and discrimination were his main "target".

For example, to overcome the distance between class, namely deprivation and some minimal consumer satisfaction, he dressed like a poor man making the two identities into one and would only live like a poor man in order to both experience it to identify himself with the poor as well as to generate a motivation in the poor and in others to remove poverty. To overcome the stigma of untouchability related to scavenging, he cleaned night soil from pit latrines and took the bodily stigma of night soil cleaning both in order to identify himself with this "dirty" task as well as to draw attention to the injustice.

To enable women to attack the stereo typing of roles which stigmatises and subordinates women, he transposed roles in the ashrams. Women would come to his marches and public peaceful boycotts, men were also asked to weave and sew and cook. Women were advised to cease to be an ornament for men to enjoy and, if necessary, to boycott sexual advances in order to resist male supremacy.

There is an idea here for all of us to consider - it is perhaps the only strategy - namely the identification with the poor, with which a united stand could, in fact, eradicate poverty. So, there is morality, and one may argue that there is, therefore, need for a spiritual base. But, there is also hard core politics and attention to economics.

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Currently there is an overpowering debate on the rupturing of our social ethic from disparate voices, and, tacitly or otherwise, the spirit of Gandhi seems to inform these disparate voices. Scholars like T.N. Madan and Ashis Nandy, and other sociologists, are beginning to recognize Gandhi's genius (Jain 2003).

Gandhi's ideas can even today provide the healing touch taking us beyond science and technology towards decent dignified societies in the best of the Indic tradition – a congruence and challenge so briefly and crisply posed by Shri. Nittoor Srinivasa Rau, at the inauguration of the international symposium *Science and Beyond*. He pointed out that both science and philosophy have a common purpose: a search for truth – so there is no conflict here. However, he added that morality has to constrain scientists from giving birth to abominations like the atom bomb – about which even Einstein was embarrassed.

End Note

 Map 1 indicates Districts with below 850 child sex ratio (the Punjab) and Map 2 of Districts showing decrease of Fifty and above points in child sex ratio (in age group 0-6) Census 2001.

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Technology, society and values

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As Indians, we are proud to be part of a civilisation that pioneered scientific thought from ancient times. In the words of Albert Einstein: *We owe a lot to the Indians, who taught us how to count, without which no worthwhile scientific discovery could have been made.* Today, for our country of one billion, the challenge is to use science and technology for economic and social progress, and, thus, leapfrog poverty barriers. To use technology for the benefit of our society, we need to have a strong value system. In this context, it is an honour to speak at this conference about technology, society and values. I thank the organisers for this opportunity.

Science helps us understand nature, and master our physical surroundings. It provides us with an understanding of the universe we live in and see around us. Frank Rhodes once said: As humans, we need to know, we are driven to explore: we cannot tolerate the constraint of ignorance. However, it is technology that provides the application of scientific knowledge to the common purposes of life. To recall a Sanskrit quotation from the Gita: yogah karmasu kausalam – yoga is skill in action; it means to say that it is action that makes a body of knowledge useful. Accordingly, it is the successful application of scientific knowledge to practical tasks that is the key to the socio-economic progress of society.

In this regard, technology increases productivity, increases efficiency, reduces costs and makes life comfortable for society. In the words of Peter Drucker: When the history of our time will be written, the most important event historians will see is an unprecedented change in the human condition. It is technological progress that makes this change possible.

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I come from a company that has benefited from using technology in all operations – from delivering solutions to clients, to increasing the productivity of employees. On a larger canvas, in a country like India where 70% of the population resides in rural areas, 26% of the population lives below the poverty line and 35% are illiterate, the anytime-anywhere and death-of-distance paradigms of technology can enable better leveraging of scarce resources.

For instance, information and communication technology can help bring medical expertise to taluks and district headquarters. Telemedicine links healthcare centres in remote locations, through satellites, with super-specialty hospitals at major towns/cities. Thus, it brings connectivity between patients at remote corners, with specialist doctors, for medical consultations and treatment.

In a large developing country such as India, there is a significant need for introducing transparency and efficiency in government functioning. Through E-governance, Government can provide the required infrastructure to effectively service citizens' needs. By separating the delivery of services from decision-making, the chances of corruption are reduced. Further, E-governance reduces the time in interactions with the government. The resounding success of the Bhoomi project launched by the Karnataka Government to digitize rural land revenue records bears testimony to this. This project has made the processing of land records more accessible and transparent. Today, the project serves about 70 lakh farmers and connects 177 taluks.

Another application of technology is in the area of planning. It enables planning through simulation – a good tool for what-if analysis. This helps us understand the parameters of public systems (over a period of time), such as pollution levels and provision of basic infrastructure – schools, water, electricity, health care, commuting times, etc.

Technology makes distance education possible. This has tremendous potential to spread learning. For instance, in the US, nearly 500,000 students have taken courses at the University of Phoenix Online, the national leader in virtual classrooms. Further, E-learning is a cost-effective way of providing education at a distance. This is especially important in India considering that around 85% of illiterates are from the rural areas.

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Overall, we have no doubt that technology accelerates growth and provides better quality of life. However, there are many instances where technology can be misused. Technology itself does not have a moral dimension. However, the way in which it is pursued and the application to which it is put has morality involved. To borrow a Sanskrit quotation used by Dr. S. Radhakrishnan, sāksaro viparītatve rākşaso bhavati dhruvam: Those who are knowledgeable are called 'sākşaras'; if they do not use their knowledge properly, then they become the reverse of 'sākşaras', which is 'rākşasa'. Similarly, technology has opened up immense opportunities, which can either be used for jeopardizing our future or harnessed to bring about progress and prosperity. For instance, nuclear energy can be harnessed for the benefit of society, or, if used in an irresponsible manner, can be detrimental to our well-being.

We have recently heard announcements that the first human clone baby was born. On the one hand, research on human cloning could lead to discovering important facts about human embryological development and gene action. This will ultimately result in treatments and cures for many dreaded illnesses. On the other hand, the notion of cloning raises issues about identity and individuality; the meaning of having children; the difference between procreation and manufacture, and the relationship between generations. Such issues raise questions about the relationship between society and technology. It has become appallingly obvious that our technology has exceeded our humanity, said Albert Einstein.

In this context, to use technology to solve the problems of society, we need a strong value system. A value system is the protocol for behaviour that enhances the trust, confidence, commitment, energy and enthusiasm of the members of the community. Values provide a framework for using technology.

Values promote decent and desirable behaviour. It encourages you to put the interest of the community ahead of yourself and to make sacrifices to ensure that the next generation is better off. A value system builds the character of the society and ensures longevity. Sustainable development is that form of progress that meets the needs of the present without compromising the ability of future generations to meet theirs. This includes preventing environmental degradation and discouraging fraud. Thus, a value system enables the use of technology for sustainable development.

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Recently, we have seen many instances of fraud and misuse in the corporate world. Greed, pettiness, short-term orientation and utter disregard for the community, as exhibited by the leaders of some corporations, have been the chief reasons for this. A strong value system encourages business leaders to adopt sustainable business practices. Sustainability is predicated on enhancing shareholder returns while being fair to all stakeholders – customers, employees, investors, vendor-partners, government of the land and society.

Hence, the need of the hour is to develop a sound value system. Society has to practise and evolve a value system that will act like a rudder that helps people handle moments of dilemma, doubt, moral confusion and conflict. For instance, at Infosys, our value system can be summed up as: *The softest pillow is a clear conscience*.

The most powerful lessons on ethical behaviour and values do not come from school discussions or classes in character building. They come from family life where people treat one another with respect, consideration, and love. Thus, a strong value system is the result of your culture, your upbringing and the company you keep. It is a matter of the heart and not of the mind. The solution is to develop such a culture.

In addition, we have to create a climate of opinion that says respect is more important than wealth. Wealth stays with us a little moment if at all, said Euripides. Further, respect for elders and God generally help in practising ethical behaviour. In the words of Albert Einstein: Only morality in our actions can give beauty and dignity to life.

We need leaders who are men and women of integrity – people who will walk the talk in demonstrating their commitment to a value system. This includes political leaders, business leaders, and leaders of the community. In the words of Mahatma Gandhi: We must become the change we want to see in the world. These leaders have to put the public good above private good. This enthuses everyone to work towards the good of the community.

In the words of James Harmon, former Chairman, Export-Import Bank of the US: Great economic powers of the future will be those countries that can harness the power of great minds and everadvancing technology. We all believe that our country is poised to

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become such a power. However, as Winston Churchill has said: *The price of greatness is responsibility*. Unless we exhibit responsible behaviour in harnessing the power of technology for our society's benefits, we will not attain greatness.

In conclusion, our progress has to be predicated on sound values that will ensure the use of technology for what is said in Sanskrit as: Sarve janāh sukhino bhavantu – maximum welfare of the maximum people. This is how countries achieve progress.

The fundamental problem of human action

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The major issue that this Symposium addresses, as I see it, is the question whether there is anything beyond science and, if so, what that is.

To attempt an answer to this question, we may begin by noting that man's relations with the rest of the universe – people, objects, nature – are mediated through knowledge and action. This idea has a long Indic history, and I can do no better than to quote one verse from the $Y \bar{o}ga - V \bar{a}sistha$ (Box 1, Narasimha 2000). As it states so categorically, both *knowing* and *doing* are equally, symmetrically important: neither is privileged over the other.

The Yoga-Vasistha on Knowing and Doing¹

| ubhābhyām.ēva paksābhyām yathā khē paksinām gatih, tath".aiva ināna-karmabhvām | l | * | |
|--|-----|---------|--|
| jāyatē paramam padam. | П | (1:1.7) | |
| It takes both of its wings for a bi | rd | | |
| To fly about in the sky – | | | |
| So it takes both knowing and doi | ing | | |
| For man to perfect himself. | - | | |

Box 1

Knowledge

Let us first begin with knowledge (for a discussion of this word as translation of jnana, see Chakrabarti 2003). Most Indian philosophical systems make a distinction between two kinds of knowledge, which, for simplicity, we may call private and public, but different systems award reality to private and public in different ways. (See for example the discussions in Hiriyanna 1932, pp. 350-351, 392-395.) Private knowledge is specific to each individual, and to each it is *the* indisputable evidence. To that extent, it is, for each person, certain to a far greater degree than any other knowledge; I am surer of my joys and sorrows than of any law of science. This private knowledge is felt or *seen*, rather than inferred or derived. The idea of *seeing* (which is not a mere ocular act, but one which involves 'realisation' in some sense) has gone into the vocabulary of Indian thought, as is demonstrated by the Sanskrit word *darsana* (literally the act of seeing), commonly translated as philosophy, and the frequent use of the word *rsi* (wise man or sage), one derivation of which means *seer*. Many Sanskrit works keep saying, almost in a formulaic way,

yah paśyati sa paśyati

- meaning roughly 'Who sees [this] has seen [it]'. Of course, different people may see truth differently, and a problem with private knowledge is precisely its personal specificity.

Public or consensible knowledge (see also Ziman 1968), by its very nature, can never be as certain to an individual as his or her private knowledge, if only because it depends on inference. Indeed, the enterprise of science can be seen as an organisation of such public knowledge, based on the fewest possible principles or rules possessing the highest possible predictive power – a prized goal in science is to be parsimonious on assumptions, fruitful on predictions. As Isaac Newton said, 'More is in vain when less will serve' (Newton 1687).

That organisation has to be consistent with consensible facts. And the total number of such *facts* that have been accumulated by man over millennia may seem huge, but they are, both in principle and in practice, discrete; furthermore, many of them are equivalent or not independent. The elaborate scientific world picture that has been built up over human history has, therefore, to depend on imagination, model, law or algorithm to fill the vast spaces between, and hopefully beyond, these 'facts': as the great Buddhist logician, Dinnāga, (4th c. CE, Ganeri 2001), declared, the only sources of knowledge are observation (facts) and inference (the structures between and beyond them). Some of the greatest science has often been based on remarkably few (although, perhaps, crucial) facts. For example, one can argue that the

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total number of facts on the basis of which Newton constructed his whole mechanics was rather small; so it was also for the theory of special relativity that Einstein formulated. From a philosophical point of view, therefore, the scientific enterprise involves a vast exercise in interpolation – an exercise that scientists incidentally find allabsorbing. This operation must be expected to be inherently uncertain, tentative, and even potentially unstable, because the discovery of new facts can disrupt the structures built between old facts. Furthermore, the old structures may be extended or replaced by new ones that may cover vaster domains (more or newer facts), and, perhaps, even possess more attractive architectures. Such disruptions or creative episodes do indeed occur during periods of what later get to be called scientific revolutions.

The fascinating thing about 'distinctively modern' science (as Joseph Needham called it), however, is that those revolutions are generally globally constructive or integrative (classical or quantum mechanics, relativity, thermodynamics, all provide good examples): the destruction they do necessarily cause is local. The success of science in thus achieving parsimonious, fruitful organisation of public evidence is both enormous and unexpected, and, therefore, actually a source of mystery. This success, in fact extrapolative, because it is often very successfully predictive, is so spectacular, so unreasonably robust and so nearly universal that one has to stand back in wonder and examine its roots. Many great scientists (including Dirac, Wigner and Einstein) have all expressed their astonishment on how unreasonably well, in fact, science works (Wigner 1960; Dirac 1963), as there is no fundamental ('scientific') reason to expect that it should. The consequence is that the possibility of reaching 'truth' through science has, to many people, become a potential object of human ambition. This ambition is fired by the further realisation that when science has found it possible to shed light on questions that had earlier been considered philosophical or metaphysical, the scientific view seems eventually to have prevailed. Examples are the motion of planets and the idea of the atom. It is, therefore, legitimate to ask whether other questions, considered till now the exclusive domain of philosophy (for example, consciousness), may yield in coming years to science.

In summary, therefore, we have a public knowledge system that has been unreasonably successful, including many cases where it has clashed with philosophy, although private knowledge appears inherently more certain to the person possessing it.

Action

However, the point that I wish to make here is that, beyond the magnificent edifice that science has been able to build in spite of its intrinsically tentative and unstable nature, one fundamental problem seems bound to remain, to any specific individual at any specific point of time. This problem is that of human action - the other wing of Vasistha's bird. Life is impossible without action, and, to the extent that it is bound to influence themselves and at least some part of the rest of the world, action by individuals cannot be based solely on either private or public knowledge. This seems clear from a reading of history. While new scientific ideas may modify, expand or overturn earlier ideas, the fundamental sources of inspiration for action seem to have changed little in the world for thousands of years. Debates about the right action in any given situation sound uncannily similar throughout history. To take only one recent example, I find it remarkable that those two great antagonists of the 20th century, Winston Churchill and Mahatma Gandhi, both felt compelled to reach for sources of inspiration more than two thousand years old in their respective cultures. Churchill spoke like Pericles in justification of what he was doing, and Gandhi quoted Krishna from the Bhagavad.gītā in justification of what he was doing. Characters from the Mahā-bhārata can be recognised in today's world. A contemporary scientist, on the other hand, rarely calls on Aristotle or Ārva-bhata to justify whatever he may be doing. The whole world agrees on $E=mc^2$, but it is split on the use of nuclear weapons or the Iraq war. Technology may even alter our private world. From coffee to alcohol, soma to psychotropic drugs people have tried, and will continue to try, to manage their inner feelings. Before long, man may be able to chart his own evolution, hard-wire into his own brain, replace his genes, delay or even abolish mortality and create new forms of life. But with all that decisions will still have to be made, and I do not see how the fundamental problem of human action is going to disappear. The problem is more one of decidability and consensibility than of free will.

It, therefore, seems clear that what has been beyond science is the ability to discover or construct a sufficient basis for human action; all the public evidence that man has acquired and all the science he has created around it, over thousands of years of human history, seem inadequate to determine the course of 'right' action in some universally acceptable way.

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This, in my view, has been seen as the central problem in many Indian texts, and has in fact been tackled again and again, most directly in the Bhagavad.gltā (e.g. Sargent 1994²). The jñāna sūkta of Rg-vēda already talks about 'the path of good action' (sukrtasya pantha, 10:71.6; Chakrabarti 2003). Contrary to a common stereotype, we must realize (as pointed out by Hiriyanna (1932, pp. 18-19) in his illuminating analyses) that Indic philosophy has actually always had very practical objectives: it has to have pravojana, it has to be useful. Going back to the Gītā, it will be recalled that this is a dialogue that takes place on a battle-field. Many Indian scholars have interpreted this dialogue as related not just to armed conflict between opposing armies, but to a deeper struggle that is going on all the time in each of us: the impending war in the *Gītā* is, according to them, only a metaphor. Be that as it may, the literal context of the $G\bar{\imath}t\bar{a}$'s dialogue is that the hero there, the brave prince Arjuna, is all set for battle but is, at the last minute, paralysed by the most agonizing doubts about the virtue of fighting it. That is, the future course of the action he should take is not at all clear to him, given all the private and public knowledge that he has at his command.

The $G\bar{\imath}t\bar{a}$ is so well known, and its prescriptions about action have been so widely studied and analysed³ (e.g. by Mahatma Gandhi, as reflected in Desai 1946), that it is unnecessary to consider them in any detail here. There is for example the celebrated verse so familiar to Indians (Box 2):

The Gītā on Action

| karmany.ēva· adhikāras.tē mā phalēşu kadācana mā karma-phala-hetur· bhūr. mā tē sangō· stv.akarmani | (2.47) |
|--|--------|
| You have authority only over your action, | |
| Not ever over its fruits; | |
| So let not reward be cause for action - | |
| But don't be attached to inaction either! | |

Box 2

I have reproduced in Box 3 some of the numerous other thoughts or phrases that appear in the $Git\bar{a}$ about action. The outcome of action is seen as mysterious, unpredictable; action has to be scorched in the fire of knowledge; action has to be undertaken if only to keep the world together; action springs from *Brahman*.

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The *indirect* message of the $G\bar{u}\bar{a}$ is, in fact, that one may have to plumb the deepest sources of private truth – from the nature of consciousness to that of the cosmic – in order to be able to embark on right action. (I am reminded here of the story, recounted by a frustrated general I believe, about scientists working for the UK-US alliance during the Second World War, who would insist that the whole rationale and strategy for fighting the war be explained to them before they would agree to turn a screw or make a calculation.) Furthermore, the $G\bar{u}t\bar{a}$ seems to suggest, it is, indeed, possible to transform private knowledge by debate and dialogue.

| gahanā karmaņō gatiķ | (4.17) | |
|---|--------|--|
| The course [outcome] of action is indeed mysterious. | | |
| lōka-saṁgraham.ēva.api sampasyan kartum.arhasi | (3.20) | |
| You have to act if only To keep the world together. | | |
| karma Brahm- ōdbhavaṁ viddhi | (3.16) | |
| Know that action Springs from Brahman | | |
| adhy.ātma cētasā yuddhasva vigata-jvarah (3.30) | | |
| Mind focused on Soul, Fight without fear. | | |
| yasya sarvē samārambhāh kāma-samkalpa-varjitāh I jñāna-agni-dagdha-karmānam tam.āhuh panditam budhāh II | (4.19) | |
| All his enterprises stripped of the drive of desire - All his actions scorched in the fire of knowledge – Such, say the learned, is the way of a wise man. | | |

The Gītā on Action (Contd.)

Box 3

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An Indian view of action is seen in one other verse which I take from the *Mahā-bhārata*. This verse (Box 4) is the answer given by the Pāndava prince, Yudhisthira, to the last question of a semi-celestial Yakṣa, about what one should do in a moral crisis⁴. (Failure to provide the correct answer invites the penalty of death, already paid by Yudhisthira's four younger brothers.) Once again, this verse seems to me to summarize, in four simple direct lines, a long-held Indic view about the complexity of determining what appropriate action is in a moral crisis. It is not a matter of black and white: *context* is all important, as Ramanujan (1990) has emphasized.

I find this answer fascinating in several respects. Distrust of monolithic authority and (dry) logic is coupled with a preference for considering multiple views: note the pluralism and collectivity associated with the word *mahā-jana*, *great men*, and the implied exercise of consensibility in identifying who they are. The principle of *dharma*, the force that sustains society, is not easy to find, but the effort has to be made to discover it, for it is the supreme goal in action.

Yudhisthira's Answer to the Yaksa's Last Question

tarkō. 'pratisthaḥ, śrutayō vibhinnā, n '.aikō munir.yasya matani pramāṇam; | dharmasya tattvam nihitani guhāyām mahā-janēna yēna gataḥ sa panthaḥ ||

Logic is undependable, the scriptures are divided, And there is no single Sage whose word is authority. The principle of Dharma seems hidden in a cave! So the only path to follow is that taken by Great Men.

Box 4

Conclusion

Let me conclude by saying that, as far as the $G\bar{\imath}t\bar{a}$ is concerned, it characteristically offers several possible bases for determining the course of action; it argues that, at least in the specific context in which

The fundamental problem of human action

it is situated, any or all of them suggest the *same* action. However, it famously leaves the final choice of the course of action to the actor himself. He is not commanded, but his sources of inspiration and private knowledge are enhanced and in the end transformed – so radically transformed, indeed, that a voluntary decision on the actor's part becomes easy and natural.

These considerations raise several issues:

- (a) Will the influence of private knowledge tend to shrink, even as that of public knowledge (science) expands?
- (b) As private knowledge is necessarily more certain for the individual and less universal for the world, can it contribute to making human conflict less likely?
- (c) What are the methods by which private knowledge can be enhanced, transformed, and, in general, more widely shared? In particular, can the methods of science, involving (among other things) non-dogmatic enquiry, debate and consensusbuilding, help?

The historical answers to (a) and (b) seem to be negative. We must, therefore, give all attention we can to (c). The $G\bar{\imath}t\bar{a}$ suggests, optimistically, that private knowledge can, in fact, be transformed, in spite of the many instances in the rest of the *Mahā-bhārata* where that could not be done.

In the final analysis, all human action, at a fundamental level, has to depend on a fusion of the private and the public, and to that extent remains currently, and seems likely to remain, outside even the frantically expanding sphere of science. That indeed is the reason to discuss what is beyond science.

Acknowledgement

I thank Prof. Arindam Chakrabarti and Dr Sangeetha Menon for their comments on an earlier version of this script.

Roddam Narasimha

End Notes

- 1. The system of transliteration used here for Sanskrit is described in Narasimha (2000).
- 2. Sargent 1994 is particularly useful to those who do not know much Sanskrit, as the text is accompanied by a word-for-word translation and explanation, apart from an overall rendering of the sense of the text of each verse in English.
- 3. Apart from Gandhi, several other Indian leaders, including Tilak, wrote extensively about what the *Gītā* meant to them.
- 4. Yaksa-prasna, The Yaksa's Questions, is a well-known episode in the Aranya-parva of the Mahā-bhārata.

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Science, peace and sustainable development*

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The world is facing today a "trilemma", or a triple dilemma. Over 3 billion people, struggling to survive with an income of less than US \$ 2 per capita per day, are crying for peace and *equitable* economic development. Countries in Southern Africa, Ethiopia and Afghanistan are in the midst of serious famines. There have been reports of children being sold for bags of wheat. The Roman philosopher, Seneca, said 2,000 years ago, "A hungry person listens neither to reason nor religion, nor is bent by any prayer".

Thus, one aspect of the trilemma is the craving for peace, and development which is equitable in social and gender terms. On another side, there is growing violence in the human heart. Terms like ethnic cleansing and biological and biochemical terrorism are being widely used in the media. The revival of small pox is becoming a possibility. The nuclear peril has again raised its head. There are over 30,000 nuclear weapons in the arsenals of major and minor nuclear powers. The availability of large quantities of highly enriched uranium increases opportunities for nuclear adventurism.

The third side of the trilemma is the spectacular progress of science and technology, resulting in increasing the *technological divide* between industrialised and developing countries. If access to technology has been a major cause of economic inequity in the past, the challenge now lies in enlisting technology as an ally in the movement for social and gender equity.

In 1994, the report of the International Commission on Peace and Food, which I chaired, was released in UNESCO by its then Director

^{*} Presidential Address: Pugwash Conferences on Science and World Affairs

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General, Prof Federico Mayor. Unfortunately, the Peace Dividend we had then anticipated, as a result of the end of the cold war and the break up of the Berlin Wall, is yet to materialise. In fact, the expenditure on military hardware and internal security is increasing day by day, particularly after the tragic events of September 11, 2001.

Contemporary developmental challenges, particularly those relating to poverty, gender injustice and environmental degradation, are indeed formidable. However, the remarkable advances now taking place in information and communication technology, space technology, biotechnology, agricultural and medical sciences, and renewable energy and clean energy technologies, provide hope for a better common present and future. Genomics, proteomics, internet, space and solar technologies, and nanotechnology are opening up uncommon opportunities for converting the goals of food, health, literacy and work for all into reality. It is, however, clear that such uncommon opportunities can be realised only if the technology push is matched by an ethical pull. This is essential for working towards a world where both unsustainable lifestyles and unacceptable poverty become features of the past.

Also, there is growing mismatch between the rate of progress in science, particularly in the area of molecular biology and genetic engineering, and the public understanding of its short- and long-term implications. There is urgent need for institutional structures which can inspire public confidence in that risks and benefits are being measured in an objective and transparent manner. Scientists and technologists have a particularly vital role to play in launching an *Ethical Revolution*. The Pugwash movement, which I now have the privilege to lead, is an expression of the social and moral duty of scientists to promote the beneficial applications of their work and prevent their misuse, to anticipate and evaluate the possible unintended consequences of scientific and technological development, and to promote debate and reflection of the *ethical obligations of scientists in taking responsibility for their work*.

It will be appropriate to quote in this context, what Bertrand Russell and Albert Einstein said in their famous manifesto of 1955 issued on the occasion of the 10th anniversary of the use of atom bombs on Hiroshima and Nagasaki:

"We appeal as human beings to human beings. Remember your humanity and forget the rest. If you can do so, the way lies open to a new paradise; if you cannot, there lies before you the risk of universal death". Shall we renounce war and violence as a method of settling disputes, or shall we put an end to the human civilization? This is the question facing us today. We are witnessing a growing intolerance of diversity and pluralism in human societies, as for example in terms of religion, ethnicity, political belief, colour, culture, gender and language. In contrast, the goal of sustainable development, accepted in various UN Conferences, including the recently held World Summit on Sustainable Development at Johannesburg, as the only pathway to a happy human future, can be realised only if there is harmony between human kind and nature. It is obvious that we cannot be non-violent to Nature, if we are going to be violent with each other.

We now have a Global Convention on Biological Diversity to help in the conservation and sustainable and equitable use of biodiversity. We need urgently a similar Convention on Human Diversity. While a Convention alone will not be able to halt the growing intolerance of diversity, particularly with reference to religion and political belief, it will help to foster a mind set which regards diversity as a blessing and not a curse. Both biodiversity and human diversity are essential for a sustainable future.

It is also necessary to reflect on methods of giving meaning and content to the ethical obligations of scientists in relation to society. The World Conference on Science held at Budapest in 1999 called for a new social contract between scientists and society. With a rapidly expanding Intellectual Property Rights (IPR) atmosphere in scientific laboratories, the products of scientific inventions may become increasingly exclusive in relation to their availability, with access being limited only to those who can afford to pay. The rich-poor divide will then increase, since orphans will remain orphans with reference to scientific attention. How can we develop a knowledge-management system which will ensure that inventions and innovations of importance to human health, food, livelihood and ecological security benefit every child, woman and man, and not just the rich? I propose that the UN explore the possibility of establishing an International Bank for Patents for Peace and Happiness. Scientists and technologists from all parts of the world should be encouraged to assign their patents to such a bank, so that the fruits of scientific discoveries are available for the public good. Such a Patents for Peace and Happiness Bank would stimulate scientists to consider themselves trustees of their intellectual property, sharing their inventions with the poor in whose lives they may make a significant difference for the better. The French mathematician,

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Marquis de Condorcet, who was a contemporary of Thomas Malthus, said over two centuries ago that the human population will stabilise itself *if children are born for happiness and not just existence*. The Government of Bhutan has taken the lead in developing a *Gross National Happiness Index*, based on the economics of human dignity, love of art and culture and commitment to spiritual values. Making all well-to-do members of the human family regard themselves as trustees of their financial and intellectual property will be essential for fostering a human happiness movement. We already have many philanthropic organisations for harnessing financial resources. The organisation, under UN auspices, of an *International Bank for Patents for Peace and Happiness* will help scientists and technologists to practise what the great Indian spiritual and intellectual leader, Swami Vivekananda, advocated as the true pathway to human fulfilment.

"In this life, give everything you can - give money, give food, give love or anything else you can - but do not seek barter".

Science, religion and harmony

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When Sir John Templeton started his great service through the John Templeton Foundation, he was not doing it for himself, but for the rest of the world, for humanity.

In the same way, scientists, spiritual masters and scholars have been striving hard not just for themselves but for the rest of the world, for their fellow beings, the laymen, the common men who constitute the vast majority of the population. I am neither a scientist nor a man of religion. I have the satisfaction that I represent the common man here.

Whatever I was doing, whether in 40 years of policing or in the area of human rights, I always was conscious of the fact that my objective was to bring order and harmony in various fields of activities.

Vasudhaiva kutumbakam, 'all creation is one family', said our ancient scriptures. All life is sacred; all living beings are products of evolution; in creation, every thing has a divine purpose and they all have the right to exist.

There is perfect harmony in creation. There is diversity, but there is harmony everywhere in every being: harmony between the body, mind and soul; harmony between individuals; between human beings and other life forms and between Nature and us.

That is how the universe was created to be. We are created to think and live in harmony with the universe. In creation, the Universe, the Cosmos, everything exists and functions in harmony; perfect harmony. But do we really have harmony in our lives, in our own body, mind and soul; with others; with Nature and between nations?

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Where and how did we lose this harmony? Throughout history, civilisation has depended upon science and religion as the two principal systems of knowledge, that have guided its development and channelled its intellectual and moral powers.

The methods of science have allowed humanity to construct a coherent understanding of the laws and processes governing physical reality and, to a certain degree, of the working of the society itself. The insight of religion has provided understanding relating to the deepest questions of human purpose and initiative.

Science and religion are instruments or expressions of human will. During moments in history, when these two agencies have operated in concert, in perfect harmony, people and cultures have freed themselves from destructive habits and practices and attained new levels of technical, artistic and ethical achievements.

Since the last 300 years, revolutionary progress has been made in the sphere of science and technology; they have brought about unprecedented comforts and conveniences. Tremendous increase in communications has reduced our planet to a global village. Yet the psychological distance between man and man has been increasing.

With the increase in the abundance of nuclear and other weapons of mass destruction, man is not feeling more secure. In fact, for the first time in human history, man has acquired the capacity to destroy himself and all other forms of life on this planet; not once but many times over. Today, every nation, in fact, everybody is living in constant fear of the other as never before.

During the last century, over a hundred million people have been killed in wars and conflicts. Most of these were fought in the name of defending peace, harmony, God or religion.

The reason is the development of science and technology to the total neglect of spirituality and ethics. Development, without being anchored on spiritual, ethical and human bases, has resulted in distortions and disruptions in society. Decline and absence of values and spiritual ethos have led to widespread problems as manifested in the alarming phenomena of consumerism, ecological crises, human rights violations, emergence of religious fanaticism, fundamentalism, bigotry, degradation of women's status and a host of other serious issues.

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As Swami Vivekananda said, "Nothing is entirely physical nor is it entirely metaphysical, one presupposes the other and experiences the other. Matter is only an infinitesimal part of the phenomenon of nature. The vast part of the phenomena which we actually see is not matter. For instance, in every moment of our life, a greater part is played by thought and feeling compared with the material phenomena outside. Science and religion each by itself is helpless to grant peace and prosperity. The awareness of spiritual knowledge is not negation of scientific rationality as religion is all-inclusive. All knowledge is for service of man. It is the real worship of God".

Again, Swami Vivekananda said, "Religion is the manifestation of Divinity already in man. Let the finite man reach the infinite". It makes man what he is and will make a human being God.

Throughout history, civilisation has depended upon science and religion, as the two principal systems of knowledge that have guided its development and channelled its intellectual and moral powers as mentioned earlier. The methods of science have allowed humanity to construct a coherent understanding of the laws and processes of governing physical reality. Science has radically changed our economic and political life.

The new millennium is the product of the discipline of modern mind we call science. As Dr. Radhakrishnan said, "The knowledge of science can usher in a new era of material prosperity. The gift of science can help to make life fuller, wider, healthier and richer in comforts and interests and in such happiness as material things can promote". But, he also warned that if science is employed, as it is today, for private profit and public destruction, there is bound to be chaos in the economic world and anarchy in the political world.

There exists a feeling of external and internal insecurity everywhere. Albert Einstein pointed out that a war with the hydrogen bomb might quite possibly put an end to the human race. It is feared that when many hydrogen bombs are used, there would be universal death, "sudden for a minority, but for the majority a slow torture of disease and disintegration".

Einstein could easily visualize the cause; he says "the present trouble of the world is due to science having advanced faster than morality. When morality catches up with science, these troubles will

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end". The present age calls for a reconciliation of science and wisdom in a vital harmony. Fortunately, the world seems to accept, though slowly, the idea that science and religion are complementary. Science has conquered outer nature. It deals with the truth of the outer world, as it appears to be around us, but this is not perfect and complete.

Swami Vivekananda aspired to bring the East and West together. Machines never made mankind happy and never will make it so. Happiness is not in the machine; it is always in the mind. "The man alone is the lord of his mind and can become happy and none else". Again he says, "Religion deals with truth of metaphysical world, just as chemistry and other natural science deals with the truth of the physical world". The book one must read to learn chemistry is the book of nature, the book from which to learn religion is our own mind and heart. The position as of today is that sages read the book within and remain ignorant of the physical sciences, whereas the scientists read the book without and remain ignorant of the reality within.

Science and religion, each by itself, is helpless to grant peace and prosperity. We should pursue the path of reason, the path of common sense and stop not till the goal is reached. Everyone, as a rational being, has to stand up. All power is within. All power is here and we can stand up and express the divinity within us.

Swami Vivekananda stresses upon the service of mankind. He says – no religion on an empty belly. According to the great master, Sri Aurobindo, "Spirituality automatically implies a fundamental change or transformation in the mental being of man".

Another great master of the century, Vinoba Bhave, told a group of scientists: "To me science is equal to spirituality – the former is more concerned with the outer aspect of the world, the latter with the inner aspect. Both combined will give us the whole world in ourselves". At the same time Vinoba Bhave also said, "Science has force, speed and action, but no direction and the direction has to be provided by spirituality".

A discourse on science, religion and development, organised in New Delhi in the year 2000, came out with this conclusion: "We the representatives of over 100 non-governmental and religious organisations gathered for the colloquim of science, religion and development, affirm the need to create a new discourse on development

Science, religion and harmony

that combines scientific vigour and a full comprehension of the spiritual dimension of life. We start with the assumption that the great majority of the world's people do not view themselves as material beings, rather they understand themselves primarily as spiritual beings, and or as much concerned with social and moral well-being, as with material progress. We find that science and religion are not diametrically opposed, as some have held, but rather they are two complementary sources of knowledge for humanity. The methods of science have allowed humanity to construct a coherent understanding of the laws and processes governing physical reality, true development is impossible without understanding of these distinct complementary roles of science and religion".

On the day India got freedom from colonial rule, August 15, 1947, which also happened to be his birthday, Sri Aurobindo concluded his message to the nation with the following words: "India's spirituality is entering Europe and America in an ever-increasing measure – that movement will grow. With the disasters of the time, more and more eyes are turning towards her with hope, and there is even an increasing resort not only to her teachings, but to her psychic and spiritual practices".

The founders of none of the religions preached violence; they never preached hatred. It is over a period of time that distortions and aberrations crept in, either out of ignorance or out of selfishness. Some religious fanatics, who want to dominate, confuse their gullible followers and create all the differences.

So, when we talk about spirituality, we are talking about the religions, as they were visualised by their founders. They were totally spiritual, later on they got into a lot of unwanted rituals and impurities.

A society with compassion for others, that cares for others, is a spiritual, ethical and moral society. Such a society will not allow political, social, economic discrimination, exploitation or injustice, which is the major cause of all the crime and movements of terrorism, insurgency and extremism.

We should sternly deal with even symptoms of terrorism, when there is killing of innocent people and destruction of public property. But at the same time, we must also go into the root causes.

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Today there is plenty of food grown, because of science and technology. There are countries which do not know where to keep all their surplus foodgrains. Even here in India, we have more than 60 million tonnes of surplus foodgrains. We do not have enough godowns to keep them, but still we see people dying of starvation.

One billion people or one sixth of humanity is living below the poverty line. Millions are dying of curable diseases. Half of humanity does not have access to potable drinking water. They do not have access to hygienic living. This is due to growth of science and materialism, devoid of spirituality and compassion.

Science and religion are complementary and as Albert Einstein said "Science can only be created by those who are thoroughly imbued with aspirations towards Truth and Understanding. The source of feeling, however, springs from the sphere of religion". He said "religion without science is blind and science without religion is lame".

Vinoba Bhave said that "Science plus spirituality is sarvodaya – progress for all. Science minus spirituality is sarvanasa – destruction of all".

When there is harmony between science and religion, there is peace and prosperity everywhere.

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Indic Traditions

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Indic challenges to the discipline of science and religion

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Overview¹

This essay problematises the way certain cultures have historicized divine intervention and viewed it as the primary mode of knowing about spiritual truth. It compares this mode with ahistorical insight received through the Indic traditions' methodology of transformation of consciousness.

There are two different, and often competing, ways of arriving at spiritual truth: (A) via historical narratives (about "holy" events, for example), and (B) via *adhyātma-vidya* (inner science or esoteric processes) which tends to be direct and ahistorical. While both methods exist within every major tradition, a given tradition tends to emphasize one or the other. The methodology by which truth gets discovered, debated, validated and accepted, becomes a central part of the core competence of the tradition, and the basis for its continuity.

The essay challenges A on scientific grounds: Can universal truthclaims be considered scientific, if they are *contingent upon a particular account of history*, especially a historical event that could never be replicated? Specifically, what does a scientist think of claims of God's *unique* interventions that are space-time discontinuities, and that either violated or permanently changed the laws of the cosmos? Can science afford to legitimize any Grand Narratives of Human History, including the teleology that God intervened to reveal? It is not this essay's intention to "blame God" for intervening; but, rather, to problematize the history-centric tendencies in societies.

On the other hand, B is a set of ahistorical methods that includes first-person empiricism. Of special interest is the question: What does science have to say about truth-claims which are based on discoveries
brought about by *human potential*, and not based on God's interventions in history via prophets? In other words, is *adhyātma-vidya* (based on inherent human potential) an empirical "science", and, if so, could it be reconciled with historically *unique* revelations?

In this classification, I interpret Jesus' original teachings as type B (ahistorical and esoteric), whereas Christianity later became type A (exoteric institutionalized power). The Grand Narratives in his name have often not been faithful to him or his message. The category of "Abrahamic religions", as used in this essay, denotes the institutions and their history-centric Grand Narratives. Prior to Constantine, Jesus had inspired movements quite similar to Indic traditions.

Should the scientific approach to spirituality be to "prove" historical narratives, or should it be an open-ended process that also examines the *methods used* to arrive at religious canons?² Should the thriving new discipline of *science and religion* apply scientific standards of inquiry to question religious Grand Narratives, and not just serve to legitimize certain religions?³ Are many scholars invested too heavily in the dominant scientific theoretical models and/or the religious outcomes of their inquiries?

The academic study of religion, and hence of *science and religion*, has been rooted in Western categories. These categories define religion based on Grand Narratives of God's interventions in human history, and have become the lens through which much of this historiography has developed.

At the same time, non-Western truth-claims of *adhyātma-vidya* are often *first* (i) harvested for their fruits, by repackaging them into Western categories, and *then* (ii) become ornaments, either digested into Western science/religion, or worn as exotic museum pieces that are not seriously examined as truth-claims. Because, they are no longer nurtured as living traditions, non-Western traditions cease to serve humanity as laboratories of inner science, especially in former colonies where the West is seen as the gold standard to emulate.

This paper challenges the trajectory of the field of *science and religion*, and shows how the use of Abrahamic categories has limited the inquiry. It includes a discussion with "liberal Christians" at the end.

Limits to ordinary mind

Before comparing different methods that are used to claim transcendental truths, let us first examine the limits to ordinary human knowledge, and the possibility of transcendental knowledge.

Most philosophies, both theistic and non-theistic, Indian and Western, accept some kind of upper limits to human knowledge. For instance:

I. Indian theories of ignorance: A central feature of classical Indian thought is the view that the world, as perceived by the ordinary human mind, is not the ultimate reality, but that it is constructed by the mind (which includes the senses). This superimposition of the mind's prior conditioning and context is referred to as nāma-rūpa (name-form). This nāma-rūpa context is the result of memory traces (samskārās), which, in turn, are the by-products of past impressions of willful actions. So the sequence could be depicted as follows:

Intentional choices \rightarrow Samskārā traces \rightarrow Nāma-rūpa \rightarrow Avidya/Māya.

The $m\bar{a}ya$ principle, as the theory of mental distortions and limits, is a common foundation to many Hindu, Buddhist and Jaina traditions, even though the terms used might be different.⁴

II. Western secular theories on the limits to mental representation: Modern Western thought has notions of similar limits of mind: (i) Gödel's theorems demonstrate that all the truths of common mathematical systems cannot be written in any language. Linguistic expression, such as that involved in mathematics, is limited in what it could possibly state.⁵ (ii) Wittgenstein's theory of language as a game is built on problematising the "mearings" of sentences and the limits of what may be representable. (iii) The quantum uncertainty principle describes the uncertainty built into the state of all physical systems. (iv) Kant considered his transcendental realm and the notion of noumena to be outside the mind's capacity. (v) A variety of post-modernist philosophers - from Rorty, to Putnam, to Derrida - each in their own way, refute any mental representation of an objective ultimate reality. I have benefited greatly from the study of Western thought in

deepening my understanding of the *avidya/māya* principles, although Western thinkers have mostly avoided making any reference to Indian systems.

- III. Abrahamic religions' approach to bridging the infinite gap between God and man: In contrast with Indian traditions, the Abrahamic religions - Judaism, Christianity, and Islam emphasize that the infinite gap of knowledge between man and God can only be bridged when God initiates a dialog with man. This is why God's interventions in human history are allimportant, and become the cornerstone of each Abrahamic religion. Without God's prophet bringing the ultimate truth to man, it would be impossible for man to transcend his limits. (See the endnote after IV, on why Prophet \neq Living Guru). Hence, Abrahamic religions are largely about history, more specifically, about God's interventions in history. These miraculous interventions occur very rarely, and, therefore, must be documented in canons and doctrines, and studied meticulously, in order to know the ultimate reality. Man has no other recourse available except this. While direct intuitive knowledge of Christ is also available, it is only after the individual has been conditioned by history-centric scriptures.⁶
- IV. Indian theories of transcendence: In Hindu, Buddhist and Jaina systems, $m\bar{a}ya$, or its equivalents, masks (as avidya) an underlying state of all mundane knowing.⁷ In other words, every human has the potential to transcend avidya. What distinguishes these systems from the Abrahamic systems is that they do not depend upon a God-initiated intervention via a prophet or son, in order to transcend the ordinary human limitations. Rather, every human has the potential, no matter how rarely achieved, to experience the state claimed by rishis, advanced yogis, jivanmuktas, buddhas, or the equivalent, wherein the ultimate truth is known directly and without mediation by $n\bar{a}ma-r\bar{u}pa$. This is a most extraordinary claim, and one that is central to the Indian traditions.⁸ (The adhyātmika process used is itself in $n\bar{a}ma-r\bar{u}pa$, and must, therefore, be transcended eventually).

The rest of this paper deals only with III and IV, which are shown in the diagram below as A and B, respectively. In other words, my assumption is that ordinary human limits are possible to transcend via some (extraordinary) processes. The purpose of the paper is to examine the essential differences between III and IV. The processes by which spiritual truth gets established differ greatly between III and IV, resulting in two major kinds of spiritual traditions: The Indic and the Abrahamic traditions are best understood by the *different ways* by which they arrive at their understandings of ultimate reality.

The Abrahamic means to bridging the gap emphasises a topdown, God-initiated intervention in human history. This intervention is via a prophet, who is also God's son in the case of Christianity. In most interpretations, as shown below, unless such an intervention is taken literally and its message is implemented, man is doomed to remain in darkness, for his mind has no other way to escape from its delusions and limits. On the other hand, the Indic traditions claim an endless stream of enlightened living spiritual masters, each said to have realised the ultimate truth while alive on this earth, and, hence, able to teach this truth to others. Unlike in the case of Indic traditions, the great teachers of Abrahamic traditions are not living models of embodied enlightenment for the student.⁹ Instead, Abrahamic teachers proclaim the truth based on historical texts. The consequences of these divergent systems are enormous, and are at the heart of Indic–Abrahamic distinctions.

The diagram that follows gives an outline of the main points that are discussed in this paper. "A" and "B" correspond to the paths of history centrism and ahistorical spiritual enlightenment respectively. The former's premise is that human limitations are inherently insurmountable without divine intervention. The latter's premise is that humans have infinite potential. These, in turn, correspond to (A) the view of man being essentially evil, and hence in need of being salvaged by God's agency, versus (B) the view of man being essentially sat-cit- $\bar{a}nanda$, the Supreme Being in limited form, with the built-in capability to achieve self-realisation.¹⁰

Historicity versus Ahistoricity

The classification of Abrahamic religions as "A" does not imply that there have not been mystics in these religions, who practised and taught the methods of "B" – Meister Eckhart and numerous Sufi mystics were such exemplars. Nor is it true that all Indic traditions are free from history-dependency: the recent Hindutva focus on Rama's birthplace is an example of history-centrism.¹¹

Each culture has had both the *adhyātmika* (esoteric) and the *laukika* (worldly or exoteric) movements within it. But there have been differences between Indic and Abrahamic cultures, in the manner in which this competition played out.

Mystics in the Abrahamic faiths were mostly on the margins of mainstream religions.¹² They were often persecuted by the religious institutions, and were rarely accepted within their own faith communities during their lives. Hence, they did not create lineages that could further test, develop, enhance, discover, and teach the "B" processes that they had discovered, often accidentally. Therefore, there were no peer debates amongst mystics who made experiential claims.¹³ Consequently, these sporadic mystical experiences did not result in the systematisation of sophisticated epistemologies, nor into rigorous procedures for reproducing them – unlike in the case of India. In the West, "mysticism" became a pejorative that meant pre-rational and inferior, and was frequently subject to persecution.

On the other hand, Indians who claimed enlightenment, using the "B" methods, were glorified and honoured as spiritual leaders during their lives, and often developed massive followings.¹⁴ Bhakti saints, Ramakrishna's "purna Vedanta" and Sri Aurobindo's integral yoga, are each examples of innovations to prior methodologies, based on embodied experience, and not based on a reinterpretation of old scripture. Such living masters have always been the loci of spirituality in India, in contrast to the institutions in the case of Abrahamic religions. Living masters often override and subvert institutional loyalties. It has also been argued that Tantra, in both Hindu and Buddhist traditions, was a reaction against institutionalisation and hierarchy. These innovators discover new spiritual technologies, and also re-contextualise the truth for their given culture, time, place and audience. As living laboratories, they subject the classical methodologies and experiential claims to test, improvement and adaptation – generation after generation.

India seems to have enjoyed a very long-term and continuous free-market of *adhyātma-vidya* ideas, practices, and lineages, where freelancers competed just as modern high-tech start-ups do. There was no attempt to enforce top-down standards, to root out quackery, or to control and license only the "best" or "true" practices. The consumer had free choice in a vibrant spiritual marketplace. There were always dissidents, many of whom launched new spin-offs in a big way, just like today's entrepreneurs in Silicon Valley. The kşatriya kings' non-interference in the spiritual free-market was an important tradition.



By contrast, top-down institutionalised religions became obsessed with history centrism and canons. They collapsed spirituality into canons, and this could be compared with a Soviet-style controlled economy – the mentality of one airline, one kind of toothpaste, one kind of breakfast cereal, and central licensing of movies, music and fashions.

Ironically, just as the Soviets made fun of the US free-market – as being anarchical and inefficient – so also, some of today's Indologists look for "canons of Hindu Law" or historical Grand Narratives, and conclude that Hindus were irrational, incoherent, and unethical.

There are, indeed, trade-offs: Religious institutions provide continuity, whereas living spiritual masters provide change and development that is free from bureaucracy and accumulation of power. Abrahamic traditions have institutional continuity, with historical canons as their centre. Indic traditions have a flow of living spiritual masters, often with considerable spiritual creativity. These processes roughly correspond to diachronic (in the Abrahamic case) versus synchronic (in the Indic case) coherence and power.

It is interesting to note that in Roman Catholicism, saints are always dead persons: As per the church's rules, only years after death is an exemplar entitled to be considered for sainthood. Why? My understanding is that living saints would threaten the institutions, because their word might overrule the dogma of the hierarchy in control.¹⁵ Carl Jung referred to churches as institutions designed to protect men from the awesome power of the Divine. Also, the vast majority of early Christian saints were glorified as martyrs, who died violently for the cause of Christianity.¹⁶ But martyrdom was never the basis for Indians to consider someone a saint.¹⁷

History-centrism in Christianity

While the Christian Grand Narrative of History has its variations, the *Apostles' Creed*, first composed in the sixth century, is the *official creed* in most Protestant churches today, and similar creeds are used in Catholic and Eastern Orthodox churches:¹⁸

I believe in God the Father Almighty, Maker of heaven and earth, and in Jesus Christ, his only son, our Lord, who was conceived by the Holy Ghost, born of the Virgin Mary, suffered under Pontius Pilate, was crucified, dead, and buried. He

descended into Hell. The third day, he rose from the dead, he ascended into heaven and sits on the right hand of God the Father Almighty. From thence he will come to judge the quick and the dead. I believe in the Holy Ghost, the holy catholic church, the communion of saints, the forgiveness of sins, the resurrection of the body, and the life everlasting.

Yet, some liberal Christians have disagreed with my analysis that Christianity is history centric. For example, Alex Alexander, a liberal Indian Christian, commenting on "Sulekha" (online magazine), explains that there is no single historical Grand Narrative in Christianity:¹⁹

There are several Christian communities that are markedly different from the Roman Catholics. First of all, there is little agreement among the eastern churches as to whether the Vatican's "codex vaticanus" is the only reliable text of the Bible, or whether their own 5th Century Codex Alexandrinus is the more authentic version. What constitutes the contents of the New Testament has always been disputed by many of these sects. The Mormons have their Book of Mormons. The Seventh Day Adventists, the Pentecostals and the Jehovah's witnesses have different interpretations of the Bible. The Quakers, Amish, Moravians, Chaldaens, Presbyterians, the Methodists, the Episcopalians, the Jacobites and the Marthomites in Kerala, etc., etc., have all their doctrinal differences and different religious hierarchies within their conclaves. They all feud and spar with each other! Let us not forget that the first so-called collection of New Testament gospels was put together nearly 200-300 years after Jesus' death. And, they all relied on Greek and Latin versions of the gospels. We know that Jesus spoke Aramaic and not Greek or Latin. The first King James Version of the English Bible came out only in 1611, followed by its revisions in 1615, 1629, 1638, 1762, 1769, 1881 and 1885. Then the American version followed in 1901, 1946 and 1989. The changes due to revisions and translations are sometimes laughable: for e.g., Luke's (17:21) The Kingdom of God is within you, is translated as: Kingdom of God is beside you, Kingdom of God is among you, Kingdom of God is in the midst of you...etc, etc., Similarly, the famous saying of Jesus, "Blessed are the pure in heart, for they shall see God" is translated in one version as "Happy are the utterly sincere, for they will see God". What will be even more

hilarious will be to translate the Greek version back into Aramaic (which has no vowels), which has different sentence constructions than Greek or Latin.²⁰ Yes, the Christians too have their differences and they are free to choose their interpretations. And they do.

But this inter-denominational conflict described by him does not imply the absence of history centrism. The above explanation does not refute my point, and in fact supports it: each of the Christian denominations mentioned is based on its own history centric canons. The fact that they disagree amongst themselves mainly about history only goes to show how much importance is given to these competing historical narratives. This clash of narratives confirms my thesis that Christianity is contingent upon the validity of some historical narrative or other.

In order to evaluate how widespread history centrism is amongst American Christians, a good source of data is the book by George Gallup, founder/CEO of the famous Gallup Poll, and a self-identified Christian evangelist. This book is based on decades of systematic polling of Americans about their religious beliefs. Here is a snapshot of Americans' religious beliefs prior to September 11, which have become even more literalist since this data was collected:²¹

- 39% classify themselves as 'born-again' evangelical Christians, defined as: (a) Bible is the Literal Word of God, (b) have experienced a personal conversion, and (c) seek to lead non-Christians to conversion [p.68]. 54% read the Bible several times a month [p.50]. 84% believe that Jesus is God or His Son [p.123].
- 79% believe in miracles [p.26]. 56% believe in Hell [p.30]. 30% believe in ghosts [p.40].
- 79% were taught religion formally as a child [p.61]. 89% want their kids to get formal religious education [p.63]. 75% like Bible Studies in schools. 75% like the Bible to be also taught as part of literature, history and social studies [p.154]. 67% support a Constitutional Amendment to allow spoken prayer in schools. (Clinton already signed a memorandum allowing public school students to pray by themselves, without teacher direction.) [pp.152-3].

- 36% claim having a "particularly powerful, sudden religious insight or awakening" [p.69]. 82% are "very conscious of the presence of God" [p.72].
- Americans have higher confidence in the Church as an institution, than in *any other institution*, including the Military, US Supreme Court, Banks, Public Schools, Newspapers, US Congress, TV news, Organized Labor, Police, Medical System, Business, and American Presidency [p.137].
- More teens than adults go to Church today indicating the future trend [p.147]. Teenagers' beliefs: Angels – 76%; Astrology – 54%; ESP – 43%; Witchcraft – 19%.

Here is yet another recent example to demonstrate the centrality of historical detail: Twenty-eight clergy of the 8.4 million strong United Methodist Church recently filed a charge within the UMC tribunal against a liberal bishop, for doubting "the virgin birth, divinity and bodily resurrection of Jesus". Indian spiritualists wonder why there is so much fuss about charges that are entirely about historical interpretations. Because the bishop said that Jesus was not the only way to salvation, he was charged with being guilty of "dissemination of doctrines contrary to the established standards of doctrine" of the church – clearly showing the rigidity by which truth-claims are established in mainstream Christianity even today. The charge acknowledged that the accused bishop "is obedient to Christ's teachings" – showing that Jesus' teachings are less important than his history. This has generated a major internal fight amongst the Methodists, about the interpretation of Jesus' history.²²

The future is also frozen by the Grand Narratives of History in the Abrahamic religions. Time Magazine recently explained: "Notions of a divinely choreographed end to history are almost as old as Western faith. They appear first in the Jewish Bible's books.... Eventually Jewish fascination with a militant restoration of God's kingdom faded. But it was embraced by Christianity".²³

Also, according to a recent Time/CNN poll, a growing number of Americans is taking the Bible's *Book of Revelation* literally as the final predictor of events: "Fully 59% say they believe the events in Revelation are going to come true, and nearly one-quarter think the Bible predicted the Sept. 11 attack".²⁴

Literalist interpretations of God's interventions in history are sometimes the cause of closed-mindedness and exclusivism. Marxism is also rooted in history-centric thought.

The above data should also be studied by neocolonized Indians, who are trying to prove their secularism, rationality, and Westernization, by developing self-hatred for their own traditions.²⁵

Two kinds of historicity

To justify history-based religious claims, some scholars have pointed out that even science has a history. Of course, science has a fascinating history. But the history of science has not been the basis for resolving scientific disputes, nor has it been the source of serious conflicts, because it is not a necessary condition for the validity of scientific claims. Science is not contingent upon history.

There is a history of Isaac Newton, for instance. However, Isaac Newton's history's relationship to the validity of gravitation laws is entirely different from the centrality of history in the Abrahamic religions. Newton's life history is neither a necessary nor a sufficient condition for the validity of the gravitation laws. It is possible for Newton's life history to be valid – that he lived at a certain time and place, that an apple fell on his head, and so forth – and yet for his gravitation laws to be found false. Hence, his history is not sufficient for the validity of the laws he propounded. Conversely, it is possible that Newton's history is false – i.e. he might have been an entirely different kind of person and lived in a different time and place, might have been a woman, and it might have been an orange that fell on his head rather than an apple – and yet the gravitation laws could be found to be true. Therefore, Newton's history is not a necessary condition for the validity of the laws of gravitation.

While it is true that there is a history of Isaac Newton, it is largely a matter of side interest to scientists, and their belief in gravitation laws is independent of any such history. The history of science, and science itself, are two separate bodies of knowledge. Imagine, if there were rival schools of physics fighting over whether it was an apple that fell on Newton's head or an orange, whether Newton had a brother, whether Newton was a woman, whether s/he existed in one place and time or a different one. Would such a profession be capable of scientific advancement?

Therefore, we must distinguish between two kinds of history. The mundane history of human events is not what I am problematizing. This would include the histories of scientists, rulers, cultures, and so forth. The laws of nature are not contingent upon such histories, and we do not have an obsession to prove any such history in order to live our lives scientifically today. However, the history of God's interventions has entirely different implications.

The Big Bang and the evolution of life are examples of unique historical events of great scientific importance. But the reason scientists believe in them is because empirical data available *today* leads to those conclusions, and not because of any historical narratives passed down to us.

Ahistorical means of truth

This section discusses several means of attaining spiritual truth, which are *not* history-centric, but are existentially immediate.

First-person empiricism²⁶

Alan Wallace explains the role of mind in any empirical investigation of consciousness:²⁷ "*The primary instrument that all scientists have used to make any type of observation is the human mind...*". However, like any scientific laboratory, one has to first clean, fine-tune, and calibrate the mind:²⁸

The untrained mind, which is prone to alternating agitation and dullness, is an unreliable and inadequate instrument for observing anything. To transform it into a suitable instrument for scientific exploration, the stability and vividness of the attention must be developed to a high degree.

This is the scientific importance of *yoga*, meditation, kundalini, tantra and other systems of achieving higher states of mind, and more evolved states of body, which may then be used to discover a deeper layer of reality:

Over the past three millennia, the Indic traditions have developed rigorous methods for refining the attention, and then applying that attention to exploring the origins, nature, and role of consciousness in the natural world. The empirical and rational investigations and discoveries by such great Indian

contemplatives as Gautama the Buddha profoundly challenge many of the assumptions of the modern West, particularly those of scientific materialism.

In the pursuit of inner discoveries, the scientist is himself/herself the instrument of observation/experience. Anindita Balslev has called this "second-order empiricism", and feels that this has been a unique achievement of Indic traditions.²⁹

To refine and develop the inner scientist's capabilities (i.e., cleaning the *antahkarana*), an important process is the cultivation of a lifestyle that minimizes mental perturbations and distractions that would reduce the resolution and clarity of experience. Rishis, yogis, and buddhas were such living human laboratories. Lineages evolved that continued the *adhyātmika* experimentation across many generations. These states led to the development of many sophisticated conceptual models and epistemologies over time. There were philosophical peer debates among inner scientists, based on these longitudinal experiments.

Sunthar Visuvalingam writes:³⁰

There is no doubt that there was much greater (and, in certain epochs such as around 600 BC, even absolute) freedom in Indian civilisation to inquire into, experiment with, and expound upon the nature of (inner) Reality (including its denial, as by the Cârvaka 'materialists'...) and its mode of attainment. A veritable technology of consciousness proliferated, armed with an arsenal of new tools such as philosophy, aesthetics, practical psychology, etc., that has [almost] no equivalent elsewhere in the world. In fact, the primary focus of the Abrahamic religions has not been esotericism, self-realization, diversification of approaches, whereas even the most ordinary Indian at least acknowledges the latter claims.

Lack of Western Adhyātma-Vidya

My U-Turn Theory may be used to model the tension between *adhyātmika* and history-centrism in many Western individuals and movements: First, there is a period of freedom from historicity, during which there is extensive learning from Indic traditions and expansion of

consciousness. Then the Grand Narrative of Western History raises its head out of insecurity; it fights, and eventually conquers whatever *adhyātma-vidya* had been embodied or conceptually learnt by that time.

Consequently, what Indians consider to be spirituality is not primary to the Abrahamic religions' self-definition. As Visuvalingam explains:

Both Judaism and Islam, for example, are preoccupied with social order and cohesion (hence the primacy of Law), which is the main reason why the spiritual quest has been relatively 'marginalised' or at least wrapped away into esoteric currents of Kabala and (Sunni) Sufism or subordinated to theological doctrine, as in the figure of the Shia Imam.

He goes on to state that the messianic impulse, embodied especially by Christianity, is focused on transforming the (external) world (as much as, if not more than, the inner man), even and especially when it breaks free of the (Jewish) Law. The same sociopolitical tension also exists between Sufis and the Islamic historical Grand Narratives.

Although the institutions that held power over society could be characterised in this manner, I feel that one must not ignore the morality, imitation of Christ-love, and inner salvation through works that were also taught by these traditions.

In each given Abrahamic religion, God gives *collective* bargains to man: Jews as the chosen tribes; Christians as all those who subscribe to the Grand Narrative of God's Son's sacrifice for them; Muslims as all who unquestionably believe in and comply with the final and complete words of God sent via his last Prophet (PBUH). Therefore, the focus of Abrahamic religions has often been extroverted. Many important canons are not about *individual* spirituality, but about collective salvation, calling for organising society and politics to defeat non-believers. Individual salvation is experienced only in an after-life in Heaven. Too often, success on Earth has been measured by collective socio-political mobilisations -- and, hence, via organised religions.

Robert Thurman's book, *Inner Revolution*, is about the need for a second renaissance, one that would be *adhyātmika*. He feels that the

first European renaissance was only *laukika* and extroverted, and that the West has not developed serious esoteric technologies of its own.

Alan Wallace goes deeper in order to explain why the West has no systematic science comparable to *adhyātma-vidya*:

The first step in developing a science of any kind of phenomena is to develop and refine instruments that allow one to observe and possibly experiment with the phenomena under investigation. The only instrument we have that enables us to observe mental phenomena directly is the mind itself. But, since the time of Aristotle, the West has made little, if any, progress in developing means of refining the mind so that it can be used as a reliable instrument for observing mental events. And... there continues to be considerable resistance against developing any such empirical science even today.

In the Middle Ages, Europeans considered extraordinary mental abilities as coming from the Devil. This association of non-ordinary consciousness with the demonic precluded the development of a technology of consciousness. European superstitions literally killed the freedom to pursue any *adhyātma-vidya*, as witch-hunting became the craze from the late fifteenth century through the mid-seventeenth century. Wallace shows that even Christian mystics imposed serious limitations on human potential, because of

the widespread conclusion among Christian mystics that the highest states of contemplation are necessarily fleeting, commonly lasting no longer than about half an hour.³¹ This insistence on the fleeting nature of mystical union appears to originate with Augustine³², and it is reflected almost a millennium later in the writings of Meister Eckhart, who emphasized that the state of contemplative rapture is invariably transient, with even its residual effects lasting no longer than three days.³³

Struggles between mystics and dogma-based hierarchy almost always resulted in the defeat of the *adhyātmika* at the hands of the history-centric. Christianity saw any rishi or buddha type of state as a threat to its historicity. Claims by spiritual adepts were condemned as man-made religions, because the notion of human transcendence during life was inconsistent with the canons. Protestantism, says Wallace,

closed the Western mind even further with regard to serious inner investigations:

With the advent of the Protestant Reformation and the Scientific Revolution, the gradual decline of Christian contemplative inquiry into the nature of consciousness rapidly accelerated. Given the Protestant emphasis on the Augustinian theme of the essential iniquity of the human soul, and man's utter inability to achieve salvation or know God except by faith, there was no longer any theological incentive for such inquiry. Salvation was emphatically presented as an undeserved gift from the Creator.

European outer science did not bring about any serious inner sciences into Europe, and the towering influence of Descartes made it worse:

Descartes, whose ideological influence on the Scientific Revolution is hard to overestimate, was deeply committed to the introspective examination of the mind. But like his Greek and Christian predecessors, he did not devise any means to refine the attention so that the mind could reliably be used to observe mental events... Moreover, in a theological move that effectively removed the human mind from the natural world, Descartes decreed that the soul is divinely infused into the body, where it exerts its influence on the body by way of the pineal gland... This philosophical stance probably accounts in large part for the fact that the Western scientific study of the mind did not even begin for more than two centuries after Descartes.

Even William James, the pioneer of Western psychology, did not have the required *empirical tools*:

James was well aware of the importance of developing such sustained, voluntary attention, but he acknowledged that he did not know how to achieve this task.³⁴

Wallace sums up the West's lack of *adhyātma-vidya* methodology as follows:

In short, the trajectory of Western science from the time of Copernicus to the modern day seems to have been influenced by medieval Christian cosmology. Just as hell was symbolised as

being in the center of the earth, and heaven was in the outermost reaches of space, the inner, the subjective world of man was depicted as being the locus of evil, while the objective world was free of such moral contamination... And it was only in the closing years of the twentieth century that the scientific community began to regard consciousness as a legitimate subject of scientific inquiry. Why did it take psychology – which itself emerged only after many scientists felt that they had already discovered all the principal laws of the universe – a century before it began to address the nature of consciousness?³⁵

Embodied knowing

The rishi-state achieved by esoteric psycho-physiological $adhy\bar{a}tmika$ practices is one of several kinds of *embodied knowing*. *Bhakti* sants use a different set of processes to achieve transcendence of ordinary human limits: These processes are based on intense devotion and surrender of the ego, combined with a simple lifestyle without anxieties. $N\bar{a}tya$, which includes dance, music, and performing arts in general, has served as another set of sophisticated processes for transcendence and embodied knowing, and is available to every human. Ramana Maharshi taught a Vedantic process of "inquiry" at all times, that leads to present-moment transcendence.

Sri Aurobindo explains that the experience of $j\bar{n}\bar{a}na$ ("supramental knowledge") gives human beings the possibility of knowing the relative in light of the absolute: one sees, touches, feels, and knows, first the infinite, and then knows or sees every form through that infinity. This extraordinary claim means that a state is possible that goes beyond the relativity and limits of ordinary mind. This transcends the distinction between experience and interpretation of experience, i.e., between ontology and epistemology.

The following summarises the distinctiveness of Indic traditions, on account of their emphasis on embodied knowing:

- 1. Every human has this inherent potential of embodied knowing of ultimate truths.
- 2. The state of embodied knowing is achieved during one's life on Earth, and does not depend upon death (i.e., it is not after entering "heaven").

- 3. Such living enlightened gurus are sometimes seen as divine. They re-verify and re-contextualise the embodied (as contrasted with historical) truth to a given community of followers, at a given time and place. This continually refreshes the knowledge, and prevents history centrism and ossification.
- 4. Embodied knowing also has major ethical implications, because (i) ethical conduct is a prerequisite for cultivating a clean mental instrument, and hence rishis *must* be ethical; and also because (ii) as a byproduct of this inner pursuit, one's external conduct becomes spontaneously ethical. Ethics is inseparable from epistemology. This is important in order to understand the ethical foundation of Indic traditions they are based on embodied knowing.
- 5. Sophisticated epistemologies were developed based on embodied knowing. However, theoreticians also had to be experimental scientists, i.e., they had to engage in long-term adhyātmika practices and the prerequisite lifestyles, in order to achieve the states discussed by the epistemologies. Today's academic scholars simply lack this empirical foundation to be able to understand the epistemologies, much less being able to critique them – regardless of how many diplomas and licenses they might have secured from their institutions.
- 6. Embodied knowing is forever reproducible, even though difficult to achieve. This is very different from history centric claims that are even theoretically non-reproducible. Therefore, *sruti* the ultimate truth that is "heard" in such states is ahistorical. It was always there, and is always available to be rediscovered in the appropriate state of consciousness. Hence, *sruti is not the same as revealed scripture*, because the latter is contingent upon history. Shruti is not only ahistorical, but is regarded as supra-human (*a-pauruseya*) and unchangeable to the letter similar to any physics formula, such as $E = MC^2$. By contrast, *smriti* is knowledge that has become contextualised in a given socio-historical context.
- 7. The achievement of embodied knowing by any individual is not a discontinuity in the natural laws of the cosmos i.e., it has nothing to do with any new covenants.

- 8. Miracles are not necessary as a means to validate embodied knowledge, although the practitioner may acquire them as a byproduct along the way. Each practitioner must self-validate the embodied knowing, through the practice of the *adhyātma-vidya*, during his/her life on Earth.
- 9. Embodied knowing is best transmitted orally in a direct interpersonal manner, though many yogis have systematically documented their experiences. Once it gets collapsed into conceptual categories, it is already disembodied. Hence, while Indic traditions have developed many highly sophisticated logical and conceptual systems of discourse, embodied knowing is considered a higher state than any intellectualism. Embodied knowing transcends all "propositions". It transcends all the linguistic boundaries of nāma-rūpa. This is why rishis and yogis have been placed higher than pandits.
- 10. Historical prophets are not a necessary condition to embodied knowing. Historical Grand Narratives can also become a major obstacle in the achievement of higher states of embodied knowing. To advance in *adhyātma-vidya*, one must give up history centrism.

Is Adhyātma-Vidya a "science"?36

The historicity of Buddha is not a prerequisite for the validity of Buddhism, just as the historical Newton is unnecessary for the validity of gravitation theory. Buddha emphasised that he was not a prophet. No God had sent him, and he was neither the first nor the last person to have discovered the nature of reality and how *every* human may achieve nirvana just as he had. He made it very clear that each person should verify his teachings for himself/herself. (Tibetan Buddhists use various deities just as Hindus use devas/devis, but they are ahistorical forces or archetypes).

Likewise, the validity of *Vedanta*, as expounded by Sankara, is not contingent upon Sankara's life history. The validity of Patanjali's *Yoga-Sūtras* is not dependent upon the historicity of Patanjali. The *sphota* theory of Bhartrhari is not based on the personal life events of that genius.

In more recent times, Ramana Maharshi's and J. Krishnamurti's teachings are not about any historical events. The same could be said of the teachings of Sri Aurobindo, Ramakrishna, and so forth. *Tantra* is entirely about embodied knowing, and there are no historical prerequisites as necessary beliefs. When one takes a course on *The Art of Living*, by Sri Sri Ravi Shankar – which is the fastest growing Hindu movement amongst well-educated Indians worldwide – one learns various techniques to achieve higher states of consciousness. The results are experienced here and now. One also learns new ways of experiencing the nature of the self. It is nowhere close to being a lesson in the history of God's interventions in some remote past.

To spiritual masters from such traditions, a fixation with a historical Grand Narrative is the worst kind of $n\bar{a}ma-r\bar{u}pa$ grasping and delusion that there could be. History centrism is seen as a major obstacle to spiritual progress. (Therefore, to appropriate Indic spiritual methods via the "new age", into an Abrahamic historical Grand Narrative, is often counter-productive).

Contemporary Science and Religion³⁷

There are largely two types of participants in the science and religion dialogue: (i) those that engage in it from the perspective of science, but who are themselves Judeo-Christians; and (ii) those that engage in it from the theological side, who are well versed in scientific theory as it applies to theology.

The latter have a remarkable impact on the re-construction of Judeo-Christianity as a "scientific theology". They make Judeo-Christianity look very sophisticated indeed, for they deploy philosophical categories, such as Whiteheadian thought, much as the ancient Christian theologians did to undermine Greek philosophy and science. Having lost in the fight against science in Europe a few centuries ago, Judeo-Christian theologians are now busy repackaging their Grand Narratives in science-compliant ways.

However, God's interventions in history are not easily resolved in scientific ways, even though these interventions are the defining moments of these religions, and the cause of most disputes.

For instance, there has been an ongoing Judeo-Christian discussion about the "mechanics" of God's activity in the world. While

Abrahamic theologians bear the burden to explain God's intervention in the world scientifically, Indic traditions have no such problem to begin with, because, within Indic theistic traditions, *Saguna Brahman* acts through his *Sakti* (the kinetic/intelligent power), which is innate and immanent within the physical universe. No fracture of natural law is necessary for Brahman to act in Indic systems. Hence, there is no need to patch up the contradictions in order to "explain". This is a radical alternative to the problem of historical intervention.

One of the most important debates in the Judeo-Christian science and religion dialogue has been the issue of proving or disproving "intelligent design". However, this issue exists because those religions perceive the "Creative Consciousness/Intelligence" to be extra-natural (and, indeed, supernatural), while Indic traditions understand it to be pervasive, immanent, and non-local. Thus *Prakriti*, being penetrated by *Cit* (Intelligence/Consciousness), can organise itself into life. There are a variety of ways in which Indic traditions deal with the intersection of materiality and consciousness, but nowhere does one find the position that creative consciousness is extra-natural.

Itihāsa ≠ History

Itihāsa is not literal history in the Western sense. *Itihāsa* is a view of the past that is continually updated, based on the present context. As Srinivas Tilak explains,³⁸

Hindus see the arrival of Sri Rama as a Grand Narrative that is made up of symbols woven into a dramatic ritual and narrative. But *itihāsa* is not a question of either myth or history, for it includes both. History is a linear mode of experience, relating primarily to the left-brain's literal knowledge. Myth, on the other hand, is a creative and aesthetic mode of experience that derives from the right-brain, reflecting a holistic mode of consciousness. Just as the left and the right sides of the brain are bridged to act as one, so in *itihāsa*, both myth and history are subsumed.

Hence, there are many *Ramayanas* across India, Thailand, Indonesia, and other places, and these have changed several times. Even in Thailand, there are towns named Ayodhya, because the villagers have constructed their *itihāsa* to believe that Lord Rama lived in their midst. Bali has a monkey forest, whose monkeys are believed

to be descendents of Hanuman's army. Local inhabitants who are unable to travel to the Ganga treat the Godavri and Narmada rivers as their Ganga for many rituals. Hindus in UK treat the river Thames as their local Ganga without any sense of transgression.

Not being handcuffed to literalist history, *itihāsa* is pliable, fluid, and allows many versions, with no compulsion to find "one true canon". Therefore, Western projects to write "critical editions" of Indian *itihāsa* are inherently flawed. Madeleine Biardeau cogently argued this for the *Mahābhārata* (against V Sukthankar).³⁹ By a forced mapping onto Western notions of history, such projects would alter Indic traditions, in the same manner as many 19th century colonial interventions re-engineered Indian society, narratives and identities. This is cultural imperialism.

Itihāsa is more about identity and continuity with one's ancestors. Itihāsa is not seen as a necessary condition for spiritual truth-claims, because there have always been many mainstream Indian spiritual movements with no reliance upon *itihāsa*. Vaishnavism, as one of many ways of being a Hindu, comes closest to having a Grand Narrative of God's interventions in human history, i.e., via the *avatars* of Vishnu. But even Vaishnavism accepts multiple *avatars*, and the puranas are able to adapt to include Jesus, Buddha, and Mohammed as *avatars* – because of the pliable nature of *itihāsa*. Itihāsa is like an ecosystem of narratives, in which new peoples may incorporate their own narratives in a mutually respectful manner.

Finally, Siva's dance is completely ahistorical. It is the universe. There is no question of a specific time or place where a "unique" intervention by Siva occurred, because Siva's Sakti is engaged with us at all times and in all places, and is immanent in, and as the universe.

Having said all this, *itihāsa* can *also* include literal historiography in the Western sense, especially in mundane human events.⁴⁰

Theology *≠ Adhyātma-Vidya*

Theologians of Abrahamic religions study ancient canons, with the same intensity as business attorneys study complex commercial contracts. They examine canonical amendments through various covenants from God, look for annexes to various clauses, try to find escape clauses in specific situations, and so forth. In fact, discussions

amongst theologians often remind me of corporate attorneys debating a complex and convoluted contract that allows many divergent interpretations.

To support this kind of theology, historiography is very important. Historiography looks at "evidence" to re-construct the "contracts" between God and man, which theologians can then work with. Hence, legal jurisprudence and historiography have dominated much of the scholarship of Abrahamic religions.

All this seems very strange and irrelevant to most Indian spiritualists, who fail to see what any of this has to do with true spirituality. This points to the core difference between Indic and Abrahamic traditions. Continuity and success, therefore, depend upon two different kinds of core competences.

The Abrahamic religions are built around institutions of jurisprudence and historiography. These institutions maintain the canons, (re) interpret them, protect them from false claims and threats, control their distribution, and leverage them as assets in expansion campaigns.

On the other hand, the core competence that determines the continued success of many Indic traditions has been the ability to produce living spiritual masters across the spectrum of space and time, in order to serve specific communities with customised teachings. This means that the techniques to achieve embodied enlightenment are all important – including various esoteric systems of meditation, *tantra*, Vedanta, *bhakti* etc. These are the tools, and not the history.⁴¹

History Centrism and Inter-Faith Relations

What, one wonders, is the reason for so much inter-religious tension and competitiveness, given so much commonality in the conclusions of all religions on science and ethics? After all, there are "liberal" interpretations that show various religions agreeing on physics and cosmology. Furthermore, ethical principles, such as loving all humans, charity, truthfulness, and so forth, are common to religions in general.⁴²

My answer is that no amount of commonality amongst religions could resolve the conflicts caused by non-negotiable Grand Narratives of History. Even if the rituals of different religions became common,

houses of worship became similar or even common, dress codes became the same, and so forth, as long as they have non-negotiable and proprietary Grand Narratives of History, they would continue to clash.

Grand Narratives are in competition for market-share. They serve as mechanisms for appropriation from others, including the use of hostile and friendly takeovers. For example, if extrapolating some obscure Christian text legitimises the claim that "Christian Yoga" was "always a part of Christianity", then it would enhance the Christian Grand Narrative. Given the popularity of yoga today, it would correspondingly inflate Christianity's brand value. Likewise, if "dowry murder" can be blamed as a "Hindu problem", then it devalues Hinduism. These brand wars are the natural consequence of history centric canons, just as a proprietary computer operating system is the basis for exclusiveness. What Windows is to Microsoft, the proprietary Grand Narrative of History is to an organised religion.

Since superiority must be claimed in order to justify aggressive proselytising, and no intrinsic superiority may be found in the evangelical religions over other faiths, either in scientific aspects or in ethics, the only way to claim superiority is via some unique claim to history. Therefore, the Darwinian expansionism of Grand Narratives overrides any and all other considerations – including commonalities of cosmology and ethics. When inter-faith dialogues proclaim commonality of morality and belief in one Supreme Being etc., they evade the point that history is the real cause of conflicts.

The Historical Grand Narrative of God's interventions is usually non-negotiable, for it becomes a source of power, and serves as a marketing brand. It leads to exclusiveness: that there is only One True History. Monotheism turns into My-Theism,⁴³ the belief that only one's own conception of theism is valid, and that all others must be falsified and demonized. Religious institutions get obsessed to defend, control and enforce their Grand Narrative of History. It becomes one's religious duty to do this as God's work. Most religious conflicts have originated with the groups that insist on a historical narrative as central, and many of these aggressions have been visited upon groups for whom such a narrative is secondary or irrelevant. Nowadays, this triggers a chain reaction of responses.

History centric religions demand bondage to historical dogma and hence deny freedom to discover spirituality for oneself. They also have

irreconcilable conflicts with other history centric religions, such as those between Christianity and Islam. Furthermore, they tend to prey upon non-history based faiths, claiming this to be their civilising mission.

While history is culture-specific, *adhyātma-vidya* is pluralistic, as has been proven by the many different forms it has taken in Asian cultures that have embraced Buddhism. The great advantage of this, as noted by Rita Sherma, is "that it does not need to destroy whole cultures and undermine entire civilisations to inculcate an acceptance of a history that, by its very nature, is exclusively representative of a specific time and place".⁴⁴

Why this matters

- Western categories have dominated the study of world religions. Hence, we find all spiritual traditions classified into monotheism and polytheism, rather than into history centric and *adhyātmika*. Furthermore, because Abrahamic religions are self-defined in socio-political terms, Western scholars have used anthropology as a principal means to "study" Indian spirituality, leading to the "caste, cows, and curry" theories of India. But *dharma* ≠ religion: this calls for a fresh examination, in which Eurocentric categories would be put under the microscope.
- The West is strong in constructing Grand Narratives for itself, 2. defending and propagating them via institutions, and using them as a source of power, including conquest and expansion. Indians today lack a Grand Narrative in the Western sense, while the traditional *itihasa* style of Indian narrative has been marginalized by "secularism". Adhyātma-vidya is incomplete by itself, as it leaves Indian society exposed to external forces that assert a God-given socio-political agenda, which is their mission on Earth. On the other hand, India has been very strong in developing a wide range of adhyatma-vidya, whereas the West lacks this dimension. A civilisation must have both, but the narratives must not be history centric or exclusivist. A strong Grand Narrative without adhyatma-vidya can become demonic and a global menace. On the other hand, an adhyatmika society that lacks laukika (worldly) narratives becomes subjugated.

- 3. Hindutva may be seen as a recent attempt to fill this Grand Narrative void, not as anything to do with *dharma* or adhyātma-vidya, but as an indigenous response to competing foreign Grand Narratives. However, I have many issues with the specific Grand Narrative of Hindutva, given its own kind of exclusivism. I would like to see Indians across all faiths (and non-Indians who choose to adopt Indic traditions) jointly construct a pan-Indic Grand Narrative for themselves. (This is why I have preferred the term "Indic"). This process should be based on a critical but fair study of Indic traditions, and should not be Eurocentric in the way Nehruvianism, Indian Marxism, and Westernized Indian Feminism have unsuccessfully tried to be. This narrative would strengthen Indian culture, giving it both: (a) individual level adhyātma-vidya and (b) collective laukika identity.
- 4. India's subaltern scholars have ignored the spirituality of the subaltern people, while claiming to champion them. This has to do with Marx's use of Eurocentric categories in his analysis of "religion". Unfortunately, he, and subsequently the Indian Marxists, blindly applied the conclusions based on Abrahamic religions as being universal to all faiths worldwide. Consequently, subaltern scholars neither have the interest nor the training to be able to understand that the true transmitters and preservers of adhyātma-vidya were the rishis, siddhas, hatha yogis, tantrikas, sadhus and bhakti sants, many of whom were from non-Brahmin and non-Ksatriya varnas.⁴⁵ The Brahmin priesthood did preserve oral and written textual works of importance, but in terms of adhyatma-vidya, the prize goes to the renunciant/yogic lineages. Unfortunately, since European religions were, indeed, dominated by elitist interests, the same lens was superimposed on the study of Indic traditions, and remains the academic practice even today.
- 5. The core thesis of this paper is that *absolute and literal historical* grand narratives are (a) unscientific, and (b) the cause of many conflicts. When these narratives are given up or reinterpreted as ahistorical, in the manner in which Carl Jung did with Christian myths they cease to serve fundamentalist evangelism.

6. The West is rapidly appropriating adhyatma-vidya from Indic traditions, because it knows that it lacks this area of knowledge systems. The goal of much Western scholarship is to assimilate Indic adhyatma-vidya into Western Grand Narratives. This is explained in my U-Turn Model.⁴⁶ They look for obscure references in their own traditions, that could be stretched and extrapolated to claim that whatever the scholar studied in Indic traditions for several decades is also found in his/her own Western tradition. This appropriation gets justified in various ways, each of which I have responded to elsewhere. Simultaneously, a parallel team of Western scholars are busy forcing Western categories upon Indic traditions, to depict them as incoherent, pre-rational, deficient in ethics, other-worldly, backward, etc. This two-pronged strategy – appropriate and demonize the source – was previously used to devastate pagan, Native American, and African cultures. Many powerful Indian scholars, journalists, English language award-winning authors, and others, are deeply invested as sepoys in this strategy.

Discussions with liberal Christians

Since the foregoing treatment of Christianity assumes mainstream Christianity, I sent the draft to several scholars who define themselves as "liberal Christians". Their main criticisms, and my responses, are summarised below, in a dialogue fashion. I have learnt a great deal from this exchange, and feel that we could open "history centrism" as a new category for analysis in religious studies.

History centrism

Liberal Christians: There is no requirement in Christianity to take God's historical intervention literally, and, indeed, if you do try to take it literally, the result is a complete contradiction.

My Response: But there are so many mandatory official creeds, which focus mainly on the literal interpretation of history. Also, why do 39% of Americans believe the Bible *literally*, as per Gallup Poll, and 59% after September 11 believe in the *literal* interpretation of Revelation? Second, if historical literalism were to be abandoned by the powers of the church, and Jesus were interpreted metaphorically as one of many equivalent rishis/avatars/gurus, would it not make conversion moot, and would it not usher in a new era of cooperation amongst religions, rather than competition? Your position is not the ground reality today.

Liberal Christians: Don't fall into the methodological error of comparing popular Christianity with the very highest and best traditions of India. It would be wrong to assume that historicity is absent from the Indic traditions. You compare exoteric Abrahamic religions with esoteric Indic religions. By far the most widely practised forms of Hinduism are *bhakti*, and look to the god in a historical context.

My Response: Western scholars readily acknowledge that most Hindus are not people of the book. Have you ever come across a single Hindu who reads the Manu-smriti (other than an academic scholar)? I have never come across such a person in my entire life. When they do read a Hindu text, it is most often the Gita; but Gita is ahistorical, as it makes no demands to believe in any literal account of history. Furthermore, under the sub-heading, "Itihāsa \neq History", I explain that the past as seen by common Indians is not the same as the Western notion of literal history. Vedas, tantras, and several other scriptures do not belong to any author. Devas/devis are ahistorical intelligences. Time and temporality are mithya, and not seen as literally real. Mainstream Christianity depends upon prophets, and prophetic = history centrism. You are trying to de-prophetize Christianity, which will not be easy, and it won't be the same religion anymore. Prophetic encounters between God and man are fundamentally different than the ahistorical experiences in yoga, tantra, bhakti, and other esoteric methods.⁴⁷

Liberal Christians: Christianity has had many internal tensions: Mark is the earliest and, in some ways, the most challenging. Matthew is the account that most deeply connects the life of Jesus with Judaism. Luke is interested in the human-interest stories and in the founding of a new religious order. John is the most mystical. "Matthew, Mark, Luke and John, Bless the bed that I lie on", is an old chant.

My Response: True. But Alex Alexander already made this point, earlier in the essay. My response was that, despite there being different Christian narratives, the overall meta-narrative, as accepted by mainstream churches, is history centric. Competing history centrisms do not negate history centrism.

Liberal Christians: An ahistorical way of knowing might not really exist. Even the body, and certainly the conceptual matrix, are arguably historically conditioned, if not historically determined.

My Response: Any conceptual matrix is $n\bar{a}ma-r\bar{u}pa$, and hence, within $m\bar{a}ya$. The state of consciousness claimed by rishis transcends all $n\bar{a}ma-r\bar{u}pa$. History fixation is the worst kind of $n\bar{a}ma-r\bar{u}pa$.

Emphasis upon jurisprudence

Liberal Christians: Christianity criticizes Judaism for too much focus on jurisprudence. Christian theologians see Jesus as coming to rectify this obsessive interest in the law. That is part of his appeal.

My Response: While Christianity is less focused on jurisprudence (as compared to Judaism), it is still very much focused on "God's Laws", and various covenants that come from time to time, that need expert lawyers to interpret.

God's immanence, and embodiment

Liberal Christians: The presence of God is considered always accessible to every Christian, merely a heartbeat away, as in the psalms, and God is always and constantly active in the world. Christians have experienced Christ in the same way as Shiva's dance.

My Response: But the experiencing of Siva is not as a historical man, who came in a specific time and place, and directed certain people to act on his behalf. Therein lies the central difference in the nature of the "experience". An experience of the historical Jesus brings his whole history as context into the mind. This is nāma-rūpa. Most Abrahamic people are very reluctant, and some outright afraid, to let go of this nāma-rūpa grasping. The Abrahamic religions posit an external God who drives history, which, in turn, creates ideology, separation, and imperialism. The ahistorical religions posit embodied adhyātmika processes (devatas) that operate the decision-making to create history. The embodied ahistorical creates unions, communities, continuity, mokşa, nirvāna.

Furthermore, Indic paths deal not just with spirituality that is attainable by everyone – consciousness as awe, saintly virtues of courage, love of all, and righteousness – but also with deep potentials of the body-spirit to the point of revealing the "anatomy" of the "ensouled body" – its subtle body, *cakras*, energies, and maps. On the other hand, the worship of historical events/persons could also be correlated with the poor record that the Abrahamic religions have regarding *the body* in spiritual growth. The milieu of India has nurtured sadhus, rishis, yogis, and tantrikas for millennia, at *all* tiers of society. The milieu of RISA (Religion in South Asia Section) and others like it is based on hermeneutical training and career advancement. These are entirely different.⁴⁸

Adhyātma-Vidya

Liberal Christians: Christianity may have turned away from *adhyātmika*, but Jesus taught "The kingdom of God is within you", and Judas went wrong because he assumed that Jesus was a this-worldly messiah or political leader.

My Response: Agreed. How I wish Jesus' followers had understood him in the same manner as he would have been understood if he had been born in India!⁴⁹

Conflict-Ridden

Liberal Christians: Hindus and Buddhists are not immune from the us/them disease, or from chauvinism.

My Response: Agreed. Indians had many intense disputes also, and there were centuries of debates. But the *criteria* on which this bifurcation occurred had nothing to do with competing accounts of history. Rather, the disputes concerned the nature of the self, the pramanas to be allowed, whether certain states of consciousness were ultimate or provisional, and so forth.

Monotheism/Polytheism

Liberal Christians: I don't think there is really much of a difference between monotheism and polytheism. Jack Miles writes in his book, "God: A Biography", that the Abrahamic traditions replaced many gods with a single God having multiple personalities. To this, the Abrahamic traditions added Satan, who functions as a Zoroastrian "other", and a whole bunch of angels, saints, Mother Mary, the Virgin of Guadalupe,

supernatural icons etc., not to mention the Trinity. Before you know it, the so-called monotheistic religions seem polytheistic in practice.

My Response: I agree with that account. But monotheism is a fundamental "Western" concept taught today in virtually every school, in college courses on comparative religions, and in Western media portrayals. It defines the teachings of Main Street's church priests. It cannot be imagined away by a few liberal intellectuals. I am glad to be in dialogue with the enlightened liberal minority of Christians, but this essay is about Christianity as being promoted worldwide today. I have no complaints against either monotheism or polytheism, but only (i) against "My-Theism", and (ii) against imposing these categories upon non-Abrahamic religions.

Finally, here is a comment by Antonio de Nicolas on the above debate: $^{\rm 50}$

It comes down to this. The West has trained its people to perform veridical agreements - this is true, this is false - but all these Western people lack the ability to make decisions in complex situations, where they have multiple choices and need the frontal lobes to view those situations. The only people who did this in the West were interlopers from other cultures -Ignatius, John, Teresa etc. They founded Orders to be able to practice these skills without the Inquisition's ears around the corner, but in public they talked theology. Moreover, these skills are borrowed from Indic texts and practices, and it is time they came together as "ONE" tradition. You are doing a very good job pointing to the problem and the differences. The opposition you encounter is that of experts (so called) unable to make complex decisions in need of frontal lobes, but are trained in "veridical" decisions for which you need nothing biological except agreement to a priori rules.

How "Western" is liberal Christianity?

Many liberal Christians are now propagating a new "Scientific Christianity" in the West. But this is largely constructed from the many unacknowledged U-Turns from Indic traditions. These appropriations reached a frenzy in the mid-19th century, when virtually every major European university created a large-scale Sanskrit department, often at

the expense of Latin/Greek. A few prominent examples of Indic appropriations into Christianity include:

- Teilhard de Chardin, the prominent 20th century scientific Christian theologian, studied Ramanuja's Vedanta, and then equated Saguna Brahman with "the body of Christ". However, he was persecuted by the Church, and lived in Asia in exile, while writing many of his works. While ignoring this background, his ideas have seeped into Judeo-Christianity as part of "scientific theology".⁵¹
- **Carl Jung** studied Indic traditions, taught summer institutes on yoga philosophy and kundalini in Zurich for a few years. Then, he repackaged this into his "original Western science", and later used it to re-interpret the Bible to make the old myths scientific. Meanwhile, he emphasized that Westerners should not practise yoga, because it would lead to dangerous consequences.⁵² I wonder what he would have to say about the fact that today 18 million Americans practise yoga, and that it has not made them world negating, irrational, or unscientific. However, many Westerners are following his advice to develop "Western *yoga*", but they are attempting this not by original discovery, but simply by repackaging and branding the Indic traditions as theirs.
- T.S. Eliot, Emerson, Thoreau, Whitman, Huxley, Steiner and many other modern thinkers were heavily influenced by Indic traditions. Later, their followers erased this influence, in an effort to preserve the "purity" and integrity of European thought, and, especially, the integrity of Christianity.⁵³

Contrary to their self-image, many liberal Christians are unable to go beyond Eurocentric worldviews.⁵⁴ For instance, Thomas McEvilley explains the suppression of one major appropriation:⁵⁵

Still, modern western attitudes towards Plotinus have not been shaped by the widespread acknowledgment of the extraordinary similarity of his teachings to doctrines taught in India in his day; but by the role he unwittingly played after his death as a formative influence on Christian theology. Translations of his work may have a churchy kind of ring. The view of Plotinus as a kind of proto-Christian may express, at least in part, a dread of finding possible Indian origins for the texts, whose influence

was to contribute to shaping the thought of Thomas Aquinas, Nicholas of Cusa, Meister Eckhardt, and many later western thinkers. So it is not only that "to admit 'oriental influences' on [Plotinus] was tantamount to besmirching his good name",⁵⁶ but even more, it would also besmirch that whole aspect of the western tradition that flowed from him. *If Plotinus had passed massive Asian influence into the western tradition, there would be little point to calling it western anymore.*

Furthermore, the new liberal Christianity is not the variety being exported to third world countries, because history centrism helps to establish Christian uniqueness for conversion purposes. I am asking liberal Christians to make a choice – between "scientific theology" on the one hand, and evangelism and proselytizing on the other. I hope that this essay triggers the following two healthy tensions within liberal Christians:

- I. The liberal Christian ahistorical interpretations at home contradict the conservative export variety of Christianity. This is similar to the way John Stuart Mill, while serving as an officer in the British East India Company for 35 years, was on the one hand responsible for studying *dharmasastras* to instruct the British on "managing" Indians socio-politically, and simultaneously, was pioneering liberalism at home. It was rationalised that Indians were not ready for liberalism, even though one could explain how Mill's study of *dharmasastras* influenced "European liberalism".⁵⁷
- 2. Eurocentric appropriations are making Indic adhyātma-vidya traditions seem irrelevant, because many scholars reference only the European equivalents to the Indic sources that they have studied, thereby making it unimportant for students to study Indic thought. Consequently, Indic traditions are facing rapid atrophy in Western scholarship. To make matters worse, a large number of highly educated and Westernised Indian intellectuals have recently been appropriated and deployed by liberal Westerners to prosecute Indian traditions, while at the same time, these very traditions are being appropriated into Western society. For example, techniques such as yoga, meditation, mantra, and guided imagery are being demonized in India as chauvinistic, communalistic, superstitious, and even fascist, by Western funded "progressive" Indians,

denying a billion people the benefits of their own traditions in terms of reduced stress, violence, and psychological disorders- which the West now enjoys. The ethical dimensions of this must not be ignored.

Notes and References

- ¹I wish to thank the following scholars for their extensive comments, criticisms, and suggestions: Jack Petranker, Sunthar Visuvalingam, Antonio de Nicolas, Rita Sherma, Cleo Kearns, Billie Grassie, Kundun Singh, Francis X Clooney, S J Srinivas Tilak, T S Rukmani, and Stuart Sovatsky.
- ²While most Christian theologians today would go for the latter option, in practice, they treat the historical claims in the Bible as boundary conditions in any such "open" thinking.
- ³Some reviewers suggested including the debate between third-person ("it is said that....") claims and first-person ("I know..."), but that is a major topic of its own, and much has been already written on it.
- ⁴For instance, Kashmir Saivism does not accept *māya* as defined by *Vedanta*, but has its own notion of ignorance in ordinary man.
- ⁵Such as the proofs of all possible theorems.
- ⁶Any intuition based on history-centric "beliefs" is still in nāma-rūpa bondage.
- ⁷In Buddhist and Jaina systems, there is no *ātman* occupying such a state, but the state is claimed.
- ⁸There are strands in Indic traditions that say that without the presence of the teacher, enlightenment and the transcendence of human limitations are not possible. But Indian living masters are not historically unique, and there is an endless stream of them, with always some in the present moment. Hence, unlike the dependence on *historical* Prophets, this is not history-centric.
- ⁹Christian saints are often deemed to be embodied models, but (i) only after they die, is it allowed to declare them as saints, and (ii) the notion of embodiment is itself dependent upon the historicity of Jesus.
- ¹⁰Note that while "Original Sin" is a specific space-time (i.e. historical) event, avidya is beginningless, and hence ahistorical.
- ¹¹Unfortunately, Hindu nationalism today often seems to be mimicking the worst things about the West. But this is different from the past of Hinduism, and is atypical even today. In the case of Christianity, historycentric exclusivism has been the basis for its mainstream power structure, at least since Constantine took control over Christianity in the 4th century.
- ¹²In very early Christianity, and in the 8th to 13th centuries, Christian mysticism was widespread, although always overshadowed by canon-based institutions.
- ¹³Even though religious orders did keep alive their mystics, such as Teresa, John, and Ignatius.
- ¹⁴It is a fair criticism by a Christian scholar that this was not always good, because it could also be abused, as it lacks institutional oversight.

¹⁵The invention of apostolic succession was an attempt in Christianity.

- ¹⁶The vast majority of them did not do the violence; they were the objects of persecution and execution.
- ¹⁷With the exception of Sikhism.
- ¹⁸H Byron Earhart (ed.) 1993 *Religious traditions of the world*. Harper Collins, p. 540.
- ¹⁹C Alex Alexander's comment on Sankrant Sanu's column, about having more than just one religion.
- ²⁰John Davidson, *The Gospel of Jesus: In search of his original teachings.* Element, Rockport, MA, p. 75.
- ²¹Surveying the religious landscape by George Gallup and Michael Lindsay.
- ²²Larry Witham 2003 Dismissal of heresy charge called 'dysfunction'. The Washington Times, February 20, http://www.washtimes.com/ national/20030220-6816151.htm.

²³David Van Biema 2002 The end: How it got that way. *Time Magazine*, July 1, pp.46-47.

- ²⁴Nancy Gibbs 2002 Apocalypse now. *Time Magazine*, Cover Story, July 1, pp. 41-48.
- ²⁵See *The axis of neocolonialism*, at: http://www.sulekha.com/ column.asp?cid=218625.

²⁶The validity of any specific first-person claims is not crucial to my thesis: What matters is that the basis for making the claims is ahistorical.

- ²⁷While his writings are about Buddhism, similar principles also apply to other Indic traditions.
- ²⁸Alan Wallace 2002 Why the West has no science of consciousness: A Buddhist view. Global Renaissance: Indic Contributions, July, NY: Menla.
- ²⁹Private communication.

³⁰Private email of 3 March 2003.

- ³¹Butler, Dom Cuthbert 1967 Western mysticism: The teaching of Augustine. Gregory and Bernard on Contemplation and the Contemplative Life. 3rd. ed., with "Afterthoughts", by Prof. David Knowles. London: Constable & Co. p.26.
- ³²Burnaby, John. (1938/1991) Amor Dei: A study of the religion of St. Augustine. Norwich: The Canterbury Press. (1938: 52 & 67).
- ³³M. O. C. (trans.) (1979 & 1987) Meister Eckhart: Sermons & Treatises, Vols. I-III, Longmead: Element Books Ltd. (1979: 1:7)
- ³⁴James, William. (1890/1950) *The principles of psychology*. New York: Dover Publications. 1: 416-424.
- ³⁵Wallace thinks that this was due "in large part to the fifty-year domination of academic psychology by behaviorism".
- ³⁶I do not accept orthodox "science" as the court of last resort in matters of religion. "Science" is used loosely in this essay to represent reproducible and ahistorical methodologies.

³⁷I am indebted to Dr. Rita Sherma for suggesting the ideas in this section. ³⁸Private email, 10 March 2003.

³⁹See 2.1.1 and 2.1.7 at: http://tiger.bun.kyoto-u.ac.jp/letter/003/ symposium/basenote/witzel-2.html

- ⁴⁰For an example of Indian "history" from indigenous Indian sources, see Ronald Inden, Daud Ali, Jonathan Walters (ed.) 2000 Querying the medieval: Texts and the history of practice in South Asia. Oxford University Press.
- ⁴¹It is interesting to note that Prof. Jack Hawley of Barnard College, NY, has launched a campaign across American campuses to charge that Diaspora Hindus are "constructing a new Hinduism". But he fails to appreciate that the very nature of adhyātma-vidya is to continually renew itself, in contrast to history-centric canonised belief systems that must wait for the next Prophet (who must first prove his status by performing miracles). Furthermore, Liberation Theology was a successful "construction" by Catholic bishops in Latin America, to counter Marxism. They were able to show that Catholicism had its own internal resources to offer better human rights, without having to adopt Marxism. Catholic theologians would not accept that they invented a new religion. Rather, they would point out the long history of Christian reconstructions as reinterpretations, each true to the Bible. Since Hinduism has been colonised, and is now neocolonised, it has not recently enjoyed the same freedom and rights to be able to reinterpret itself for each situation. But in earlier times, Hinduism did reinterpret itself many times, each time from within, i.e., without Western grants to scholars to document "human rights" violations. So this process is to be seen as: (i) natural organic development in any system that is not fossilised; (ii) the tradition within India for a long time to make changes; and (iii) similar in some ways to what Christianity has been doing to itself. Therefore, could one surmise that Hawley's problem is that the changes would be brought about by insiders, and not imposed by (neo) colonialists from the outside? Note that Veena Oldenburg's and also Dirks' latest books point out that a major part of the colonial agenda was to blame native culture for all sorts of problems, and then to use this excuse to "reform" in ways that suited the colonial interests. Indigenous reform or natural evolution was seen as a threat to colonial control - a moving target makes the job more difficult for the hit men. Might there be a similar threat perception on the part of the Western-controlled academic study of India? This comment points the microscope back at the role of asymmetric power in Indology.
- ⁴²There are major academic campaigns to try to show that Indic traditions lack progress, ethics etc., and that these are unique gifts brought by Christianity. However, these are distortions, which are sustained only through control over the production and distribution of Religious Studies in the academy.
- ⁴³I am indebted to Ravi Ravindra for first suggesting the term "My-Theism" to me, in an email comment.

- ⁴⁵For example, see Pinch, William R 1996 Peasants and Monks in British India. Berkeley: University of California Press, http://ark.cdlib.org/ark:/ 13030/ft22900465/.
- ⁴⁶A summary is given in "The Axis of Neocolonialism", http://www. sulekha.com/column.asp?cid=218625.

⁴⁴Private email.
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- ⁴⁷I have a speculative side theory that does not impact this paper: India's Varna system was a classification of job descriptions, before it degenerated, and especially before it got re-engineered in the 19th Century into the modern caste system. [See Nicholas Dirks' Castes of Mind, 2002.] It was merit based. Ksatriya and Brahmin were separate jobs, whose duties were defined as 'Ksatriya dharma' and 'Brahmana dharma' respectively, and never held by the same individual. The king was always a Ksyatriya, never a Brahmin, thereby avoiding the possibility of a theocracy. This separation also corresponds roughly to exoteric and esoteric domains respectively. Hence, neither of these domains was supposed to subvert the other, and each had its own separate champion. Theocracy doesn't have much meaning in the Indian context, for the Brahmins never entertained the project of making everyone else embrace their mode of living. The term is more suitable for societies held together by a common uniform theology imposed by a religious elite firmly holding the reins of power. Furthermore, the true transmitters and preservers of adhyātma-vidya were the rishis, siddhas, natha yogis, many of whom were from non-Brahmin and non-Ksatriya varnas. The Brahmin priesthood did preserve oral and written textual works of importance, but in terms of adhyātma-vidya, the prize goes to the renunciant/yogic lineages. However, it could be that the very existence of a Brahmin domain, that the rulers could not meddle in, might have protected the entrepreneurial spirituality of all jatis. Because varna has not been objectively examined today, and has simply been conflated with the abusive caste system, this feature of classical India deserves further inquiry. Might it explain the long-term respect and empowerment for esoteric movements across all social strata in India?
- ⁴⁸I am reminded of a conversation with Francisco Varela, one of the top Western practitioner-scholars of Indic *adhyātma-vidya*, who did a U-Turn into Euro-Phenomenology. I asked him where one could find *practitioners* of Husserl's phenomenology, and where the Western *adhyātmika* adepts were being nurtured. He was silent for a while, and then replied, "One of the problems of Western hermeneutics is that we don't have a *yoga*. There is no such place".
- ⁴⁹I do believe in the veracity of Jesus' teachings, when interpreted in an Indic framework, such as the analyses done by Ravi Ravindra.
- ⁵⁰Private email.
- ⁵¹See: (a) Ursula King 1980 Towards a new mysticism: Teilhard de Chardin and Eastern traditions. London: Collins; (b) B Bruteau 1974 Evolution toward divinity: Teilhard de Chardin and the Hindu traditions. Wheaton: The Theosophical Publishing House and (c) Ann Hunt Overzee 1992 The body divine: The symbol of the body in the works of Teilhard de Chardin and Ramanuja. Cambridge University Press.
- ⁵²Harold Coward 1985 Jung and eastern traditions. SUNY Press. Also, Harold Coward 2002 Yoga and psychology. SUNY Press.
- ⁵³See: J J Clarke 1997 Oriental enlightenment. Routledge; Carl Olson 2002 Indian philosophers and postmodern thinkers. India: OUP; Thomas McEvilley 2002 The shape of ancient thought. Ilworth Press; Silvia Federici (ed.) 1995 Enduring western civilization: The construction of the

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concept of western civilization and its 'others', Praeger; Cleo Kearns, T.S. Eliot and Indic Traditions. Cambridge University Press; P S Pai 1985 T.S. Eliot, Vedanta and Buddhism. University of British Columbia Press; Alan D Hodder 2001 Thoreau's ecstatic witness. Yale University Press; Sumita Roy, Annie Pothen, K S Sunita, (eds) 2003 Aldous Huxley and Indian Thought. Sterling Publishers; Graham Parkes (ed.) 1987 Heidegger and Asian thought. University of Hawaii Press; T.R. Rajasekharaiah 1970 The roots of Whitman's Grass. Farleigh Dickinson University Press.

- ⁵⁴Eurocentrism is a sort of collective superego, sometimes unknown to the person and unconsciously applied. It becomes more extroverted under stress – for instance, after September 11, there is sudden prejudice against brown-skinned Americans, contradicting all sociological trends. The Eurocentric grand narrative that was always there got activated under perceived threat.
- ⁵⁵Thomas McEvilley 2002 The shape of ancient thought. Allworth Press, p. 550.
- ⁵⁶Albert M Wolters 1982 A survey of modern scholarly opinion on Plotinus and Indian thought. In: Neoplatonism and Indian thought, Baine R Harris (ed.). Norfolk, Virginia: International Center for Neoplatonic Studies, p. 295.

⁵⁷See: Uday Singh Mehta 1999 Liberalism and empire: A study in nineteenthcentury British liberal thought. The University of Chicago.

Scientific content in the exploration of the spiritual world in the Jain tradition

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As science makes more and more progress, it appears to give the impression/feeling that man is getting closer to knowing everyting. However, there are certain aspects of life, which defy any explanation. The Indic traditions abound with literature containing knowledge that transcends the boundaries of the physical world, which is the traditional realm of science. Many doubts are raised about the validity of this knowledge. What is the experimental proof, one asks? We forget that all physical experiments correspond to the physical world and use physical apparatus. There is only one apparatus that is physical as well as spiritual. This apparatus is the "human being" itself. It is the most sophisticated and sensitive instrument, which measures, observes, analyses, and concludes. It has the ability to look beyond the physical world, and it is this ability that was used by ascetics and spiritual beings to gain insight into the nature of objects in the universe. These accomplished beings carried out experiments and made observations using this apparatus; this is spiritual quest. The knowledge so gained cannot be said to be without experimental proof. Only, most of us do not know how to carry out these experiments. All our scriptures assert that there is another world beyond our physical world. It is, however, a different matter to make sense of this spiritual world. The spiritual quests of ascetics/mystics are nothing short of scientific explorations of the beyond. I present a brief glimpse of the scientific approach inherent in this knowledge, as embodied in the ancient Jain canons of Dhavala, Jai-Dhavala, and Maha-Dhavala.

Introduction

The physical world is divided into two parts: the macroscopic and the microscopic. The macroscopic is composed of the microscopic, yet the laws that govern the two are vastly different. While Newtonian classical mechanics is sufficient for the former, one has to use quantum

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laws to describe the latter. Esoteric relativistic effects must be incorporated in certain situations. Time itself plays a curious role by showing up in most unusual ways. Even after a century of familiarity with both the quantum domain as well as the relativistic ideas, they continue to pose a certain degree of mystery to the human mind. There is always this nagging feeling that there is something beyond it that we do not understand (unless you have a purely mathematical outlook). Even for those who are mathematically inclined, intrinsic difficulties begin to arise in one or the other situation. Stepping out of the physical world composed of non-living objects, we are even more bewildered by the questions raised by the existence of human beings. And not only human beings, but all living beings and other objects in nature should constitute the realm of our quest.

Often our lives seem to be full of suffering, disease, pain, anguish, and violence. Among these myriad of agonizing events are scattered moments of fleeting joy and happiness. This raises many difficult but interesting questions. The most profound of these is, "Are there any laws governing our actions and fate, and what causes these events in our lives?" According to most of the Indic traditions (and religions), such laws do exist and these laws of karma govern our life cycle. An understanding of these laws can tremendously help us in leading a much more peaceful and joyous life.

The meaning of karma is action. "Whenever we perform an action, we are bound to reap its fruits, which are either pleasant or unpleasant. We either cling to these fruits or attempt to get rid of them, and in the process, we again perform actions. These actions in turn breed fruits, and these fruits breed more actions. Life between birth and death is a field of karma in which we sow and reap and sow again. If we do not extricate ourselves from this cycle, we are one day harvested by the force of time. Then we are no longer the creators of our karmas, but instead are created by them. This is the bondage of karma. Freedom lies in breaking this cycle, for only then are we able to unveil the mystery that lies in the realm between death and birth" (Tigunait 1997). The Jain scriptures are famous for presenting a very intricate formal framework of the theory of karma. In this paper, I merely present a glimpse of the scientific approach adopted by sages in presenting this subject, which is so complex and largely experiential in nature, in a formal way.

A brief history of the Jain canons

The ancient Jain scriptures of Dhavala (Jain et al. 1939-58), Jai-Dhavala (Shastri et al. 1941-88), and Maha-Dhavala (Shastri 1944-70) are commentaries on the Jain canons Sat-khandagam, and KashayaPrabhrat. These scriptures have been preserved since the 7th century AD in the famous Jain temples and matha of Moodbidri, Karnataka. The Omniscient Lord Mahavira is the Chief Author of the subject matter contained in these scriptures. This was transmitted by Lord Mahavira to Chief Disciple, Indrabhuti Gautam (known as the first Gandhar), in psychical form. Lord Mahavira had to wait for sometime before he could find a fully prepared and deserving disciple in Indrabhuti Gautam. Indrabhuti was a Brahmin of Gautam lineage, proficient in the four Vedas and six Vedic limbs of (i) education, (ii) music, (iii) ethics, (iv) grammar, (v) metrics, linguistics, and (vi) mathematics and astrology. Indrabhuti Gautam transformed himself into the mode of physical scriptures and composed 12 Angas (Primary Canons) and 14 Purvas (Pre-canons). Thus, Indrabhuti Gautam is the chief author of the canonical texts in physical form. Indrabhuti Gautam delivered both types of scriptural knowledge to his Chief Disciple Loharya, and Jambu Swami. This knowledge was carried by word of mouth through a succession of 20 scholar ascetics (Acharyas), and came down to Dharsen in partial form (in the 1st century AD). It was the belief of the ascetic scholars that this knowledge must be given to only those who deserve it and are fully prepared to receive it. Holding of this knowledge without preparation would convey wrong notions and meanings. This knowledge, therefore, remained with only a chosen few. Moreover, it was not supposed to be the subject of intellectual playfulness, and the ascetic masters were hardly interested in exhibiting their intellectual prowess to others. However, Dharsen became fearful of the loss of this knowledge with the passage of time. He expressed his fear through a letter to a congregation of Acharyas in the South of India. The Acharyas seriously considered the contents of the letter and sent two young and brightest ascetics to Dharsen for receiving this knowledge. Acharya Dharsen taught the two scholars, named Pushpadant and Bhootbali, only after he examined them and was satisfied that they were worthy of receiving this knowledge.

Pushpadant and Bhootbali composed the Satkhandagam during the period 87 AD to 157 AD. These texts are in the form of Aphorisms or Gathas (verbal equations). Later, Acharya Virsen and Jinsen wrote detailed commentaries on these canons, now known as Dhavala, Jai-

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Dhavala, and Maha-Dhavala, which were completed in 837 AD. Dhavala is about 72000 slokas in size, and Jai-Dhavala is about 60000 shlokas in size. These scriptures, preserved in Moodbidri (Karnataka) are written in Prakrit language and the old Malayalam script.

A glimpse of the constructs and methods in the theory of karma

All Indic traditions accept that knowledge is supreme and is the only way to achieve salvation. The ultimate knowledge is Absolute, and once it is achieved, a living being (*jiva*) gets liberated. It must be emphasized that intellectual knowledge is not sufficient; it is the experiential knowledge that counts more than the intellectual knowledge. The theory of *karma*, working behind the scene, strictly follows the law of cause and effect. Once there is some action, it is bound to have an effect. One's reaction to the effect further generates new karma and the cycle goes on and on. An understanding of this is essential for ultimate freedom.

There are two means of valid cognition (Jain 2003): (i) physical, and (ii) psychical. It is the second variety that is more important here, and will be briefly described. Psychical knowledge has five varieties: (i) sensory knowledge, (ii) scriptural knowledge, (iii) clairvoyance, (iv) telepathy, and (v) absolute knowledge (omniscience). Before describing these very briefly, it is necessary to describe the various factors necessary for gaining the knowledge.

Knowledge of an object must be gained through six factors: (i) Verbal roots (*dhatu*), (ii) positing, or installation (*niksepa*), (iii) standpoint, or purport (*naya*), (iv) synonimity (*ekartha*), (v) etymology, or derivation (*nirukti*), and (vi) disquisitional enquiry (*anuyoga*).

Positing provides definiteness to an object. It has six varieties: (i) Name (*nama*), (ii) representation (*sthapana*), (iii) substance or potential (*dravya*), (iv) space (*ksetra*), (v) time (*kala*), and (vi) mode (*bhava*).

Standpoint (naya) has two varieties: (i) Substantive (dravyarthik Naya) – the one dealing with general aspects, and (ii) modal (paryayarthika naya) – the one dealing with the changing phases.

As a rule, objects are created and destroyed with respect to modal standpoint. However, objects are always uncreated and non-destructible

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with respect to substantive standpoint (substantively they are eternal). All objects should be examined through six disquisition doors (*anuyogadvaras*):

- (i) What is the subject or object (kim)?
- (ii) To whom does the subject or object belong (kasya)?
- (iii) What is cause or the means of knowing it (kena)?
- (iv) Where is it found (kasmin)?
- (v) What is its duration or lifetime (kiyat-ciram)?
- (vi) What are its varieties (kati-vidham)?

Let us now return to the five types of psychical knowledge.

Sensory knowledge is attained in four steps:

- (i) apprehension (Avagraha)
- (ii) speculation (Ihaa)
- (iii) perceptual judgement (Avaaya)
- (iv) retention (Dhaarana)

Its means are touch, taste, colour, smell, sound and all other seen, heard, and experienced objects. It has 336 varieties beginning with these 12: many, many kind, quick, hidden, un-expressed, and lasting along with their opposites and their further combinations.

Scriptural knowledge deals with objects other than those known through sensory knowledge.

Clairvoyant knowledge is the direct knowledge of the mattergic reality (Pudgal) with respect to its four aspects – substantive, spatial, temporal, and modal. It may be mentioned here that non-living matter and energy have been treated at the same level, and a common term Pudgal has been used for them, which has been translated here as mattergy or mattergic reality.

Telepathic knowledge directly knows the material objects in the mind of others together with the mind itself (as mind is also a mattergy).

Absolute knowledge or omniscience knows all about the past, present, and future of all the realities (Padartha – living and non-living) and their modifications.

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The second *Gatha* of *Dhavala* states: "The two-fold scriptural knowledge (physical and psychical) indicates that there are *fourteen* stations of investigations (Marganas) for realising the *fourteen spiritual* states (Guna-Sthana) of Jiva (living-being)". These fourteen spiritual states are progressively higher and higher in terms of accomplishments, and the last stage is that of the Omniscience. A precise description of these fourteen states and the transitions from one to another has been given in these scriptures.

Order, measures, and mathematics

The karma theory also needs order and measure in its investigations. Five types of measures are defined: (i) substantial, (ii) spatial, (iii) temporal, (iv) modal, and (v) standpoint based.

Substantial measures are put into three classes:

- (i) Numerable (Samkhyat)
- (ii) Innumerable (Asamkhyat)
- (iii) Infinite (Anant)

As an example, further classification of numerable is encountered as follows:

- (a) Minimal numerable (Jaghanya samkhyat)
- (b) Medium numerable (Madhyama samkhyat)
- (c) Maximal numerable (Utkrsta samkhyat)

Innumerable has nine varieties like:

- (1) Minimal limited innumerable (Jaghanya parita asamkhyat)
- (2) Medium limited innumerable (Madhyama parita asamkhyata)

:

(9) Maximal innumerable innumerate (Utkrsta asamkhyata asamkhyat)

To obtain an estimate of Jaghanya parita asamkhyat, an interesting mathematical operation called "Vargita-samvargita" of a quantity to various orders, is defined. The first vargita-samvargita of x is defined as $x^x=y$. The second vargita-samvargita is y^y . And so on. As an example, if x=2, then next numbers are 4, 256, and so on.

Similarly, a "calculational infinity" (*Ganananta*) has been defined, which has a parallel to the proper infinity of Cantor. We also encounter infinity greater than another infinity. Eleven types of infinity have been defined in *Dhavala* (Jain 1992).

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A term "Alpabahutva" is frequently used, which signifies the smallness and largeness of actual or calculational infinities. Other interesting aspects are the postulation of existential sets (*Rashi* and *Rashi Siddhanta*), usage of various kinds of sequences, etc.

Spatial measures used in the scriptures are:

- (i) Finger length (Suchyangula)
- (ii) Finger square (*Pratarangula*)
- (iii) Finger cube (Ghanangula)
- (iv) Universe length (Jagasreni)
- (v) Universe square (Jagpratar)
- (vi) Universe (Loka)

Following temporal measures are encountered:

- (i) Pit (palya)
- (ii) Ocean (Saagara)

Further classifications of *Palya* and *Saagara* exist. Time is also talked about as a quantized entity, and its quantum is defined as *Kaalaanu* (time quantum). The standpointal measure has seven varieties. A few of them are:

- (i) Pantoscopic
- (ii) Collective
- (iii) Pragmatic, etc.

We come across the following technical terms:

- (i) Samaya an indivisible portion of time
- (ii) *Pradesa* space occupied by an ultimate particle (*Parmanu*)
- (iii) Kaalaanu time quanta filling up the continumm of space
- (iv) Paryaaya of a Dravya phase of a reality
- (v) Agurulaghutva non-gravity-levity, etc.

An interesting postulate is encountered: "A particle (living or nonliving) in its motion, during the indivisible instant of time, occupies more than one space-point along a straight line". This postulate is in conflict with the understanding in classical physics that there is a oneto-one correspondence in the position and instant of time during the motion of a particle. It implies that a body is present at more than one place simultaneously, something possible in quantum physics. Moreover, the concepts of quanta of space and time are very clearly

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present. A detailed study of the mathematical concepts, symbols and their meaning in the present context, may be found in the study of the famous canonical text *Labdhisaar* (Jain 1994).

A beautiful article, which discusses the mathematics used in *Dhavala*, can be found in the fourth volume of *Dhavala* (Singh 1942). Incidentally, this article has been written only on the basis of the third volume of *Dhavala*. All the fundamental mathematical operations like addition, subtraction, division, multiplication, extraction of square- and cube-roots, the raising of numbers to given powers, etc., are found in *Dhavala*. These operations are mentioned both with respect to integers and fractions. The usage of *Vargita-Samvargita*, as outlined above, indicates that the authors were fully conversant with the laws of indices. Interesting usage of operations like *Ardhaccheda*, *Vargasalaka*, *Trkaccheda*, and *Caturthaccheda* clearly points to the knowledge of logarithms to the base of 2, 4, etc. All the basic rules for working with logarithms are encountered.

Foundations of Syaadvaada and modern quantum theory

Any discussion of Jain philosophy remains incomplete if the principle of "Anekaant" and its exposition by "Syaadvaad" in terms of Saptabhanginaya are not mentioned. This principle emphasises that a complete world view of any object requires the knowledge of a set of dual (and opposite) nature/attributes, and this fact is conveyed by the seven-fold description of the object. Thus, Anekaant is the principle which allows us to experience the true nature of an object, and Syaadvaad is the method of describing it in words (Charukeerti 2003). These seven predications are:

- Syaadasti: partly, it is.
- Syaadnaasti: partly, it is not.
- Syaadasti naasti cha: partly, it is and it is not.
- Syaad-avaktavyah: partly, it is indeterminate.
- Syaadasti cha avaktavyascha: partly, it is and is also indeterminate.
- Syaatnasti cha avaktavyascha: partly, it is not and is also indeterminate.
- Syaadasti naasti cha avaktavyascha: partly, it is, it is not, and is also indeterminate.

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Here, the word *Syaat* has been translated as "partly". Sometimes, it is also translated as "may be". However, "may be" carries a flavour of doubt in it, and this is not the meaning inherent in *Syaat*.

The modern view of the material world is governed by the quantum theory. This theory works in a way that is not only very subtle, but also very mysterious. It is commonly perceived that the quantum theory is probabilistic in nature. While this is true, such notions are not entirely correct. The quantum theory works according to well-laid out rules and is quite deterministic in nature as far as its explanations of physical phenomena are concerned. It, however, seems to operate at a different level, and because of conceptual difficulties, we encounter problems in interpreting its results. This leads us to believe that the theory is probabilistic in nature. An attempt was made by Kothari (1985) to relate the seven-fold way with the quantum view of the world. His attempts were preceded by the earlier works of Mahalanobis (1957) and Haldane (1957). He considered the example of an atom in a box with two compartments. One of the possibilities allowed by quantum theory is that the atom simultaneously exists in both the compartments. Kothari opined that the atom, being in both the compartments at the same time, is the 'avaktavyah' or the indeterminate described above. Kothari, however, did not stress the fact that the quantum world operates at a different level, where there are no probabilities, but only amplitudes. When we make a transition from the inner level of quantum theory to our level where we live and observe, we must square these amplitudes giving us a probabilistic interpretation. Taking the square of amplitudes has to be done in a special way, since the amplitudes are not just real numbers but complex.

As pointed out by Penrose (1994), the two most important ingredients of quantum theory are the theory of probability and the concept of a complex number. According to Penrose, it is at a very tiny underlying level of phenomena that the laws of complex numbers hold sway, whereas it is in the bridge between this tiny level and the familiar level of our ordinary perceptions that probabilities play their part.

It is possible to extend these ideas to the world of living beings also and draw a parallel. We assume that there are two levels of the physical as well as the mental world; the underlying level of quantum amplitudes, where these complex numbers are important, and the classical level of the familiar real signals and quantities, which is our

real world in which we live. Let us illustrate these ideas by considering the description of an electron. Classically the electron might exist at a location A, or it might exist at another location B. Quantum mechanics, however, provides a number of other possibilities. The electron is thus allowed to occupy both the locations A and B simultaneously. If we denote the situation when the electron is at A by the symbol $|A\rangle$ and the situation when the electron is at B by $|B\rangle$, then according to quantum theory, a state $p|A\rangle + q|B\rangle$ is also possible, where p and q are complex numbers. Here p and q denote the amplitudes or the weight factors in favour of $|A\rangle$ and $|B\rangle$ respectively. The only puzzling part is that these amplitudes can be complex in nature. Kothari basically suggested that p and q represent the probability of the electron being in $|A\rangle$ and $|B\rangle$ respectively. Since the electron must be somewhere, the sum total of p+ q must be one, the total probability. However, p and q are complex amplitudes and, hence, cannot be the probabilities of our real world. In order to obtain the probabilities, we must take the modulo square of these numbers and get real numbers.

The particle at any point of time is understood to be in a state which we denote by $|\phi\rangle$. The state $|\phi\rangle$ is an ensemble of many basis states, each occurring in $|\phi\rangle$ in different measures (amplitudes). Let us build a picture of a two state system, where the basis states are $|is\rangle$ and |is not). Therefore, in general

$$|\phi\rangle = a ||is\rangle + b ||is not\rangle + u ||is\rangle + v ||is not\rangle.$$

Here a, b, u and v are amplitudes, or fractions of $|\phi\rangle$ being $|is\rangle$, |is not\rangle, *indeterminate* $|is\rangle$, and *indeterminate* |is not\rangle, respectively. The probability that the system is in the $|is\rangle$ part of the state is given by $(a^2 + p^2)$. Similarly, the probability that the system is in the |is not) part of $|\phi\rangle$, is given by $(b^2 + q^2)$. Since the total probability must be 1,

$$a^2 + b^2 + p^2 + q^2 = 1.$$

The indeterminate (here the imaginary part) becomes real determinate on squaring. It, thus, appears that the actual wheels at work, which decide the nature of a system, are in the complex domain; we only see the effects in the real world. It is in this context that the statement, "quantum world (and also the spiritual world) operates at a different level", can be made. The seven-fold way or prediction may now be written down in terms of the two basis states and the use of complex number in a very simple way:

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- Syadasti: partly be, it is $\equiv a$ is).
- Syadnaasti: partly, it is not $\equiv b$ is not).
- Syadasti nasti ca: partly, it is and it is $not \equiv a |is\rangle + b |is not\rangle$.
- Syad-avaktavyah: partly, it is indeterminate $\equiv tu$ is).
- Syadasti ca avaktavyasca: partly, it is and is also indeterminate $=a + \iota u$ is).
- Syadnasti ca avaktavyasca = partly, it is not and is also indeterminate = b + tv is not).
- Syadasti nasti ca avaktavyasca: partly, it is and it is not, and is also indeterminate $\equiv (a + \iota u) |is\rangle + (b + \iota v) |is not\rangle$.

What mathematically requires just two basic entities and their combinations, requires seven ways of description in words. It must be added at this juncture that the use of $|is\rangle$ and |is not \rangle as the basis states of an object or a system is only symbolic and illustrative.

Conclusions

We conclude by saying that the knowledge embodied in the ancient scriptures (the Jain canons here) point towards the existence of very profound and deep-rooted truth. This truth is related to the "beyond", and is not within the reach of the physical probes. Yet, it does have a very definite framework of operation, strictly following the law of cause and effect. Presentation of this "experiential" truth, in a formal way in terms of physical concepts, must have been a very arduous job. Yet, sages have tried their best to convey this truth as best as they could, and, in doing so, they have used considerable amount of mathematics. We must be careful in negating this knowledge outright, just because it does not make sense to our intellect conditioned by the physical world.

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The cosmic dance of Siva: An icon of science and beyond

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Introduction

This paper explores the cosmological implications of the imagery of the celebrated icon of Nataraja representing the dancing Hindu God, Siva. The 10th century Chola metal image of Nataraja from Tamil Nadu in southern India has become one of the best known emblems of Indic culture, inviting the attention of artists, dancers, scientists and philosophers in India and abroad. It has also become, perhaps, the most evocative symbol there is anywhere in the world of the coming together of science, mysticism, cosmology, religion and art: which is why it is explored as an 'icon of science and beyond' in this essay.

Ever since art historian, Ananda Coomaraswamy (1921), wrote his Romanticist essay of 1921 on The Dance of Siva, the notion that the Nataraja represents the 'cosmic' dance of Siva has gained universal appeal. This interpretation captured the imagination of scientists. However, in several invocations, Siva is also the dark lord of destruction dancing at the cremation grounds. Hence, the question arises as to what the original significance of the Nataraja icon was, and whether the Nataraja imagery really encompasses a significant cosmic or scientific dimension. This paper explores this question by bringing together fresh insights from literary and art historical sources, as well as, insights from scientific and archaeometallurgical investigations on Pallava and Chola bronzes (8th-11th centuries). It is argued that the paradigm of worship of Nataraja at the coastal shrine of Chidambaram in Tamil Nadu does represent an intellectual watershed for its time, by providing a physical representation (both architectural and anthropomorphic) of a conceptual reconciliation between dynamic cosmic forces and the inner consciousness; and contains the rudiments of ideas that have only been grappled with since the last century in modern science.

Siva Nataraja as cosmic dancer

Perhaps, the universality of the Nataraja image as a cultural icon lies in the fact that it transcends boundaries from being a purely religious icon to an artistic and conceptual one. Indeed, one could argue that what lies beyond science, and, perhaps, even beyond religious experience because it is truly universal, is aesthetic experience. In that sense, it seems appropriate to mention that it was the renowned French sculptor, Auguste Rodin (1921), who drew the world's attention to the Nataraja icon in 1913, in an essay titled *La Danse de Siva*, where he described Nataraja as '*une chose divinement réglée*' i.e. something which is divinely ordered.

The Nataraja bronze (Figure 1) is generally thought to represent the *ananda-tandava* or dance of bliss of Siva, depicting the performance of the *pancha-kritya* or five actions. Creation is suggested by the drum in the right rear hand, destruction by the fire in the left arm, the vanquishing of evil, ignorance and the ego being symbolised by the trampled demon, *apasmara*, who is underfoot, protection by the front right arm in *abhaya* mudra, the giving of solace symbolised by the left arm crossed in *danda hasta*, while the circular aureole or *prabhavali* depicts the cosmos in perpetual flux in cycles of creation and destruction. This cosmic activity is inspired by Parvati as consort *Sivakami*, the energising female principle or *Sakti*.

The notion of the Cosmic Dance of Siva was first clearly articulated and popularised by that philosopher and art historian *par*



Figure 1. Nataraja, Kankoduvanithavam, Government Museum, Chennai

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excellence, Ananda Kentish Coomaraswamy, a Sri Lanka of aTamil Saiva background. Coomaraswamy was originally a geologist and scientist by training, so that his writings capture a scientist's delight at discovering a visual metaphor for scientific abstractions: *... He (Shiva) rises from his rapture, and dancing sends through inert matter pulsating waves of awakening sound...This is poetry, but none the less science' (Coomaraswamy 1921).

Thereafter, the idea of the 'Cosmic dance of Siva' becomes known across the globe through the popular science writings of bestselling author, Fritjof Capra (Capra 1976), who most successfully packaged eastern mysticism to a western audience. In his cult favourite book, the *Tao of Physics* of 1974, Capra euphorically wrote that the dancing Siva is 'the dancing universe, the ceaseless flow of energy going through an infinite variety of patterns that melt into one another'. Although, his assertions about the validity of the parallels between scientific discoveries made in the 20th century and mystical ideas from a millennium ago may be far-fetched, one must credit Capra's imagination for discerning in the Nataraja imagery some nuances of the revolutionary ideas of quantum mechanics, which overthrew classical physics in the last century and for which, by implication, more satisfactory parallels could not be found from within deterministic western philosophical systems or Judaeo-Christian traditions.

That the Nataraja imagery can be viewed as an anthropomorphic visualisation of dynamic cosmic processes is supported by passages from some texts. The *Naisadhiya-charita* (Sivaramamurti 1974, p. 147) poetically describes the dramatic cosmic effects of Siva's dance with the scattering of myriad stars in the sky and the splintering of rocks and crystals of mount Kailas. The *Vadnagar prasasti* of Kumarapala (Sivaramamurti 1974, p. 147) describes Siva as playing with crystal balls, as if they were newly created planets.

At the same time, it must be pointed out that, in many early Sanskrit and Tamil invocations, including the Tamil Tevaram hymns of the 7th–8th centuries, Siva is often described as the brooding and awesome lord with unkempt locks smeared with ash, presiding over the cycles of death and destruction, dancing and wandering around cremation grounds, the destroyer of the ego. Indeed, Saiva images at the 8th century cave temple of Elephanta, off the coast of Mumbai in western India, mainly depict Siva in this frenzied form known as the *aghora rupa*. So, what is it about the Nataraja metal imagery that lends itself to a more benign interpretation of Siva as the cosmic dancer? This question is addressed in the next section.

Chidambaram as the cosmic consciousness and scientific connotations

The Nataraja metal icon is a unique contribution from Tamil Nadu, which differs from all other depictions of Siva. It is said to describe what is called the *ananda-tandava* of Siva or the 'dance of bliss' which, according to the local *sthala-purana* or legend, he is said to have performed at the site of Chidambaram along the sea coast of Tamil Nadu. In that sense, the emergence of the depiction of the Nataraja metal icon seems to be linked closely to the *sthalapurana* or local legend of Chidambaram.

Coming to the dating of the Nataraja metal icon and the milieu within which Nataraja images came into vogue, generally speaking, it is believed to be a 10th century Chola innovation. However, archaeometallurgical investigations undertaken by the author suggest otherwise, as discussed in a paper on dating the Nataraja (Srinivasan 2001). The author, as part of her doctoral thesis, (Srinivasan 1996), from University of London, had undertaken research on the applications of scientific finger-printing techniques, such as lead isotope ratio analysis and elemental analysis, for exploring the problems of dates and provenances of South Indian metal icons. Over a hundred and thirty South Indian metal icons from the Government Museum, Chennai, Victoria and Albert Museum, London and British Museum, London, were technically investigated (Srinivasan 1999). From the lead-isotope ratio and trace element fingerprints obtained for different stylistic groups of images, it appears that the Nataraja metal icon was already in vogue under the Pallava dynasty of Tamil Nadu of about the 8th to early 9th century. In fact this fits in with the idea that the worship of Nataraja at Chidambaram was probably already in practice by the 7th-8th century as suggested by the compositions of Tamil Saiva saints like Appar. Figure 2 is a Nataraja metal image from Kunniyur in the Government Museum, Chennai, that the author has dated to the Pallava period on the basis of the lead-isotope ratio fingerprints. In fact, the expression on the face does convey the state of ananda or delight or blissful equilibrium associated with the anandatandava or dance of bliss of Nataraja. This beatific expression seems to differ from fiercer manifestations of Siva. It is likely that this philosophical shift may have had something to do with the influence of the philosopher-saint, Sankara. Sankara's lifetime is thought to have been around 788 to 820 AD (Younger 1995).

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Figure 2. Nataraja, Kunniyur, Government Museum, Chennai

Perhaps, more interesting than the imagery of the Nataraja in itself, and more relevant in the light of modern physics and studies in cosmology and consciousness, are the philosophical implications behind the paradigm of worship of Nataraja at Chidambaram: the concept of the *ananda-tandava* or dance of bliss said to have been performed by Siva as Nataraja at the site of the Chidambaram temple.

The temple of Chidambaram is the only shrine where the Nataraja metal icon of dancing Siva is worshipped in the inner sanctum or *garbha-griha* in place of the aniconic *lingam* or cosmic pillar (Marr 1989). In all other Siva temples elsewhere in Tamil Nadu, metal Nataraja icons are only processional images for festivals or the *utsava murti*. Within the Chidambaram temple, the Nataraja image is worshipped inside the golden-roofed structure called *chit sabha*, i.e., 'hall of consciousness'. Exploring the etymology of the word "Chidambaram" itself, one of its meanings could be as follows: *chit* translates as "consciousness", and *ambaram* as the "cosmos", so in that

sense, Chidambaram itself could signify "cosmic consciousness". In a hymn to Nataraja 'kunchitanghrim bhaje' composed by the 13th century Tamil poet Umapati Sivacarya (Smith 1998) of Chidambaram, Siva as Nataraja performs the ananda-tandava or dance of bliss and is also described as sacchidananda or the one whose mind or consciousness is in a state of the dance of blissful equilibrium. The metaphor of dance is also celebrated through the sculptural representations within the Chidambaram temple complex of 'karanas', the 108 cadences of Siva's dance.

Another interesting aspect about the paradigm of worship of Nataraja at Chidambaram is the enigmatic 'Chidambaram Rahasya', which is found inside the golden-roofed "Chit Sabha" by the side of the Nataraja metal icon. The Chidambaram Rahasya, which can be translated as the secret revelation of Chidambaram, is nothing but an empty, curtained space wherein Siva is worshipped as the formless akasa lingam, which is quite simply the element, sky. The curtain represents the aroopa or formless manifestation of Sivakami or Shakti, the primordial feminine energy, who inspires and witnesses Siva's cosmic dance. Perhaps, this presages an intuitive or rudimentary understanding of concepts such as the wave-particle duality of quantum physics, with matter and energy, being sides of the same coin. The Tatvaryastava stotra (Sivaramamurthi 1974, pp. 105-106), a hymn on Nataraja at Chidambaram, describes Siva as sky-clad and Chidambaram as the sacred spot for the element, sky, and it also describes Siva as 'maya-nataka-sakshi', whereby Siva, as Lord of the universe, is both the universal dancer and the witness of his own dance. who creates and removes maya before finally ensuring emancipation. Maya, represented by a black curtain behind Nataraja in the Chit Sabha at Chidambaram, can be interpreted as a 'measure of reality' with the Mayamata being an ancient text on architectural measurements. Therefore, not only is Siva's dance cosmic, but Siva can also be identified with the sentient universe, as well as with the consciousness within, which creates and destroys notions of reality. These ideas hint at quantum mechanical paradoxes such as observer-created reality inherent to Heisenberg's Uncertainty Principle. They also bring to mind the ideas of physicists such as Roger Penrose (Penrose 1989), which explore connections between quantum mechanics and consciousness, bringing to mind notions of a grand unified theory of the forces of the universe, encompassing quantum consciousness.

Conclusions: Nataraja as a holistic icon of science, dance and art

As elaborated in the previous section, it can be argued, from a postmodernist perspective, that the paradigm of worship of Nataraja at the coastal temple complex of Chidambaram in Tamil Nadu does manifest a cosmological worldview, which hints tantalisingly at ideas put forth by modern physicists and which goes to the heart of the dilemma of exploring external reality as represented by science in relation to the 'beyond' of experiential reality.

While subjective aesthetic experience is something that may lie beyond the realm of scientific objectivity, the wide appeal of the concept of Nataraja, as the cosmic dance of Siva, lies in the fact that it affirms the possibility of a bridge between impersonal science and an experiential 'beyond', between the domain of the abstract and the boundaries of the human, between the realm of consciousness and dynamic matter, integrated through the medium of dance, as well as the metaphor of motion. Indeed, a well-known invocatory hymn to Siva performed in the classical South Indian dance form of Bharata Natyam captures well this conceptual *tour de force*, linking dance, motion and the cosmic forces.

'Angikam bhuvanam yasya, vachikam sarva vangmayam aharyam chandra taradi, tam namaha satvikam sivam:

'That whose body is the universe itself, That which resonates everywhere as sound, That which is adorned by the moon and the stars, Obeisance to that sublime entity: Sivam...'

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The making of a Sadhu: An inquiry into higher states of mental health

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My interest in the Indian spiritual traditions and higher states of mental health can be traced to two teachers who made a great impression on me during my student days. The first was Dr N C Surya, who had his professional education at Maudsley Hospital, London, which is generally accepted as the citadel of psychiatry in the world and who came back to India with a burning desire to teach his students the wisdom of Indian heritage along with what he had learnt in the West. The other was Dr Erna Hoch, a Swiss psychiatrist, trained in Medard Boss's Existential School and who had come all the way to India to study Indian spiritual traditions. To both of them, I must pay my homage before I proceed further. They laid the seeds in my mind for continuing with what they had started. If I have been exploring the domain of Indian spirituality for the last 40 years, it is not only so that I and my students could base our professional work on Indian cultural values but also because, along with many others, I believe that Indian spiritual traditions can make a major contribution to the profession of mental health care across cultures. Just to quote one world renowned stalwart, "... the psychotherapist who is seriously concerned with the aims of therapy cannot remain unmoved when he sees ... (that) ... this question has occupied the minds of the East for more than 2000 years and in this respect methods and philosophical doctrines have been developed which simply put all Western attempts along these lines into shade" (Jung 1958).

One thing which persuaded Jung, and many others who followed him, to make remarks of this kind, is the fact that while in the last 100 years or so, the profession has made great advances in the understanding and the treatment of *mental disorder*, it has very little to say about *mental health*, the experience of which we all have enjoyed at rare moments and which we know intuitively as an ideal to be reached. It is claimed that Indian scriptures not only describe the state of mental

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health with clarity and confidence, but also teach methods for reaching this state and *holding it at will*. To learn this first hand, I spent a sabbatical year in 1981-82 learning *yoga* under the supervision of a Guru, putting down in my daily diary the experiences I was going through. This has been described elsewhere (Kapur 1994).

At about the same time, I started looking at Sadhus and Sanyasis who claim to live in this state most of the time, if not all the time. "Do they really"? I wanted to know.

Paradoxically, my interest in Sanyasis came from quite the opposite direction also. Schizophrenia is a serious mental disorder about which, unfortunately, we know very little. One theory about Schizophrenia, which has a great appeal for me, is that potential schizophrenics have very thin ego boundaries. Under stressful situations, these boundaries become even weaker and these individuals then cannot distinguish self from non-self, thus developing psychotic symptoms like thought intrusion, delusions, and hallucinations. There are researchers (Corin and Lauzon 1992) who claim that these people often develop the strategy of 'positive withdrawal', i.e., a deliberate rejection of social contact and communication with others. I wondered if Sanyas were a technique of positive withdrawal, which provided a safe space for some would-be schizophrenics. A few years ago, I had a chance of meeting Prof. Corin and found out that she as well as her husband, Professor Bibeau, were involved in a cross-cultural research programme on the theme of marginality. They were studying people who, for one reason or the other, were living at the margins of the society - like psychotics, immigrants and so on. I acquainted them with the fact that the Sanyasis of India voluntarily chose to live on the margins of society. We all got interested in finding out if we might find potential schizophrenics amongst the Sanyasis. For the last four years we have been working together, studying the tradition of Sanyas from various angles.

There were a few other reasons for my interest in this inquiry. I was interested in studying mystical experience. I had read several accounts of this phenomenon and knew that certain environmental conditions could bring about a mystical experience. It is well-known that Sanyasis follow specific practices to bring about such an experience for themselves. I wanted to get a direct description of this experience from them and also learn more about the methods they use to bring it about.

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Yoga Sutras talk of Siddhis, i.e., special powers like ability to fly, to be invisible or acquire as much strength as an elephant. In fact, fiftyfive of the hundred and ninetysix aphorisms in Patanjali's Yoga Sutras (Taimini 1971) talk only of these special powers. It is rumoured that some Sanyasis possess Siddhi powers. I was interested in finding out whether there were really some people who could go beyond the known laws of physics.

One last reason for my interest in Sadhus related to my profession as a therapist. Having grown up in India, I know that many more people go to Sadhus and Sanyasis to deal with their emotional problems than to professional psychiatrists. I wondered if there was something I could learn from Sanyasis, which would help me and my co-professionals become better therapists. This is a very ambitious agenda and I have been pursuing this for the last 20 years, initially by myself, but for the last four years along with Professors Corin and Bibeau. Every year for a period of a month or so, I go to the Himalayas along with my wife, Prof. Malavika Kapur, who is a Clinical Psychologist herself, conducting interviews with Sanyasis, some of whom reside in the holy towns of Hardwar and Rishikesh and some who live high up on the mountains and are reachable only after arduous trekking.

Who is a Sanyasi?

Before going further, let me attempt a definition. The words Sadhu and Sanyasi have different roots but are now used interchangeably. A Sanyasi (Ghurye 1995, Tripathi 1978, Gross 1992) is one who:

- (1) has given up connection with his family and home,
- (2) has taken *diksha* (initiation) from a Guru to make a formal entry into his new way of life,
- (3) follows some specific rituals in day-to-day life as prescribed by the order to which he belongs,
- (4) wears sectarian marks and clothes prescribed by the order to which he belongs,
- (5) stays celibate,
- (6) has no personal possessions except a few clothes and symbols which mark him out as a Sanyasi,
- (7) does not indulge in any money-making enterprise and depends solely on the earnings of others,
- (8) leads a nomadic life or a monastic life in an ashram according to the decision made at the time of initiation.

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These are the minimum common characteristics of Sanyasis belonging to different orders but there are exceptions to all of these. For example, there are *Gharbari Sadhus* who are formally initiated but continue to lead life as householders. There are Sadhus, like those belonging to the *Swami Narayan* group who possess lands, make investments and live on their own earnings. Many *Maths* and modern ashrams are adept at strategies for financial gain, but the claim is that the money is for the public good and not for themselves. There are Sadhus who have not taken any *diksha* and claim the Hindu God Siva as their direct Guru.

History of Sanyas

Asceticism or Sanyas has been a part of Indian civilisation from its very beginning. There is a claim that it is a pre-Aryan tradition and there are those who believe that the clay figurines found in excavations of the 4000-year old Harapan culture, showing coiled hair and sitting in yogic postures, are actually those of Sanyasis. These authorities believe that this pre-Aryan tradition was incorporated into Brahmanical culture later on to the extent that Sanyas became the last of the four stages of conduct of life of the common people. From a psychological point of view, I tend to think that the rigid caste structure with prescribed dharma for each of the caste groups could not but have created an antithesis for itself in the institution of Sanyas. In any case, there is a reference to Sanyasis and Sadhus in the later texts of Rigveda, Samhitas, Brahmanas, Upanishads and Dharmasutras, Dharma Shastras, epics like Mahabharata and Ramayana, stories like Panchatantras and Katha Sarit Sagara, and plays by Kalidasa give details of the ascetic way of life. Wendy O' Flaherty (1973) makes a very interesting analysis of tension between asceticism and eroticism, a tension which has existed in the Indian mind from the dawn of history, best epitomized in the descriptions of Siva, who is an ascetic par excellence and yet a householder - running off to tapas for long periods of time, only to come back to Parvathi from time to time. Hindu mythology, Hindu medicine and Hindu physiology also consider the power of semen and the power of Tapas to be the same. Growing youngsters in modern Hindu households are even now advised by elders not to waste semen and thus retain health as well as spiritual power.

Sectarian structures of Sadhus

There are three major subdivisions of Sanyasis - Vaishnavites, Saivites and Saktas respectively. They respectively worship Vishnu (especially his incarnations Rama and Krishna), Siva and Sakti (the female power). Each of these is divided into a variety of subgroups and each subgroup is divided further into more subgroups. The total number of subgroups may be a thousand or even more. Very broadly, Vaishnavites wear variations of a perpendicular tilak, emblems of Vishnu on the body and white clothes. Saivites wear variations of a horizontal tilak and ochre robes. Saktas also wear ochre robes and horizontal tilaks (but with a slightly different design). The major group amongst the Saivites is the Dashnami Sadhus. This group was in fact assembled and given a coherent structure by Sankaracarya out of the motley crowd which had become quite disorganised by his time. The ten subgroups are Giri, Puri, Bharati, Vana, Parvat, Aranya, Sagar, Tirtha, Ashrama and Sarasvati. We find these attached to the names of Sadhus belonging to these subsects. Amongst the Vaishnavites, Sri Sampradaya is the most ancient, linking itself to Ramanuja. These Sadhus are mainly of Brahmin origin and scholars of Sanskrit and Hindu theology. They consider themselves superior to others.

Ramanandis link themselves to Swami Ramananda, a radical Sadhu who gave diksha to women and lower caste people. They worship Rama and Krishna. *Tulsi Das* and *Kabir* were Ramanandi Sadhus. *Bhakti* is their main form of *sadhana*.

I do not know much about the Saktas. Ananda margis are members of this group but I think most of these have got absorbed in the Saivite Sampradaya, taking their *tantrik* practices with them. These may be very secret groups of which scholars are not aware. Both Vaishnavites and Saivites have their select branches of warrior Sadhus or *Nagas* – who are supposed to protect the Sanyasi groups and other Naga groups. They live in various *Akharas* in pilgrimage centres and have a very strict and prolonged initiation ritual. These days most of them smoke ganja, walk around with a swagger and are either *digambara* (naked) or *shwetambara* (with white clothes) They are generally aggressive and spend their time having wars with each other. In 1998 when I went to Hardwar, I could see the aftermath of a fight between the members of the *Niranjani* and *Juna Akharas*. They had destroyed each other's property and thrown each other's valuables into the Ganga. *Har ki pairi* where pilgrims take their dip was closed for visitors by the Government authorities who took some time to clean up the mess in the river.

The course of inquiry

My first encounters in this research were not very satisfactory. I met an internationally renowned Sanyasi who was keen to have scientists on board. He told me that his 'scientist' devotees were carrying out very sophisticated experiments, looking at the effect of specific types of meditation on the electro-encephalographic (EEG) patterns. When I said that EEG patterns were in fact a very crude reflection of what was going on in the mind, he said that his EEG machine was made in Germany! Another internationally famous Sanyasi asked me to feel the tightness in his gluteal muscles when I asked him if he had developed any special powers. This taught me to keep away from these jet-set Swamis and look at those who were not seeking international fame.

Armed with a loosely framed agenda, I have, for the last twenty years, been interviewing Sanyasis in the State of Uttaranchal, which rests in the lap of the Himalayas and boasts of pilgrimage centres most revered by Hindus. *Rishikesh* where I usually start my one-month sojourn every year has over 300 *ashrams* and the neighbouring *Hardwar* has more than 600 *ashrams*. In the months of April–May when I usually visit these places, one can see an army of Sanyasis tramping on foot up and down the mountains, going to or coming back from the holy centres of Gangothri, Jamunothri, Badrinath and Kedarnath, all of which are at heights above 10,000 ft. One also sees throngs of devotees who come to bathe in the sacred Ganga as well as to sit at the feet of these Sanyasis, wanting to learn how to lead life less painfully.

I have interviewed over 100 Sanyasis in these years. Some of them I have met in Rishikesh, some I have caught up with as they walk towards the holy centres, and to meet some I have trekked to great heights varying from 12–15 thousand feet. Most of them have cooperated to the fullest extent with my inquiries, though some have wondered at the purpose of this questioning. Only a very few have refused to answer questions. The interview schedule has improved with time, much more so after my Canadian colleagues and I sat together to formalise some specific areas of inquiry. This was about two years ago but even now the conversation is informal and free flowing, with me mentally ticking off the areas of inquiry as we talk. The interview

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durations have averaged between 2 and 4 hours, but with some of them I have spent a longer time, staying in the ashram or their humble cottages high up in the mountains. All of them have been generous with hospitality and I do not remember any one asking for money, though I have on my own given varying amounts of money. The interviews have covered, in the main, the following areas:

- 1. Life trajectory from birth onwards till present
- 2. Reasons for taking Sanyas
- 3. Details of spiritual practices
- 4. Relationship with the Guru
- 5. Relationship with 'God' and God-head
- 6. Relationship with other Sanyasis and society at large
- 7. How they handle sexual needs
- 8. Mental health
- 9. Mystical experience
- 10. Special powers if any

Some findings

It is not possible during the course of one presentation to deal with all the above issues, but I shall say a few things about some aspects that I have found most interesting.

Reasons for taking Sanyas

Though I have met over 100 Sanyasis, I have interviewed 40 of them in some detail. Amongst these 40, there were 12 who took Sanyas because of social circumstances, such as (a) disturbed family relationships, (b) loss of a dear one, (c) hostile relatives, (d) poverty or (e) disillusionment in working life. Some were given away to Sadhu groups in their infancy and one of them seemed to have escaped from the law.

There was this young man, son of a rich industrialist, who rebelled against his very dominant father and, after experiences with drugs and cults, decided to become a Sanyasi. There was this lawyer who could not cope with the lies he had to tell and hear in his profession and decided to get away from it all. There was this elderly Sadhu who, after a successful stint as a householder, gave up the worldly life after his wife passed away. There was this agriculturist who lost one arm in the thresher and decided to live in an ashram, as he knew no other way of making a living.

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These reasons do not surprise us. Sadhuhood, which provides a safe space and some basic needs of life like food and shelter, can appear very attractive if life has treated one very harshly. However, my inquiries revealed that most of this group continued to carry their baggage of pain, despair, doubt, betrayal and disillusionment. Some, of course, made serious attempts to lead a spiritual life and their stories are very poignant indeed. We shall however not go into their stories, but concentrate instead on those 28 who did not have any reason to escape and for whom Sanyas had held attraction *for as long as they could remember*. As a psychiatrist, I have a special training in digging up dirt, but in the lives of these 28, I could not discover any incident or experience which could have driven them to this other worldliness. Let us take up a few examples.

There was this rich farmer's son who ran away from his home thrice, at the ages of nine, sixteen, and twenty-two. He was brought back every time and sent back to his studies. He grew up to acquire a first class M.A. in sociology. He was going to Delhi for a job interview when he met a Sanyasi in the train. He got down with the latter much before reaching Delhi, started life as a Sanyasi and has never gone back home since.

There is the fascinating story of a woman, who could recite mantras when she was 4, had memorised the *Bhagavad Gita* by the time she was 7 and decided to take Sanyas when she went at the age of 15 to listen to a spiritual lecture by a famous Sanyasi. The family tried hard to fight this desire of hers, persuading her first to become a doctor, then a post-graduate in obstetrics, and then a medical superintendent of a hospital. She gave in each time but finally when she was around 40 years of age and still unmarried, she got initiated into Sanyas. She rolled with laughter as she narrated her story. Though she occasionally gets called on to perform medical duties in the *ashram* where she lives, she spends most time at her *Sadhana* and transcribing her Guru's lectures.

There is the story of this engineer from a poor background who went to USA with 8 dollars in his pocket, rose up to a very high position in an electrical industry and then decided to become a Sanyasi when he was 38. When asked why he did so, he said that he wanted to do so since childhood but waited till his brother and sister were well educated and settled.

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There was this son of a respected judge, who decided to become a Sanyasi when he was eight and became one when he finished his schooling.

None of the above had any psychologically sensible reason to give up worldly life. They were all from happy families – they were good students and they were well integrated in their social network. If asked why they took up Sanyas, all of them say it was because of *prarabdha*, their *karma* in previous lives. One cannot argue with such statements. What I found to be true in all cases was that they were very religious right from childhood.

Spiritual practices

All Sanyasis have a daily routine of the sadhana or the spiritual practices they perform. The spiritual practices differ according to the sect they belong to. There are the Vedantins who spend their lives studying the scriptures with a view to changing their mental attitudes through intellectual discourse. There are others who have a more emotional routine - singing *bhajans* to their chosen deities. There are those who follow the discipline of Hatha Yoga. Then there are those who take up very difficult vows. I have seen Sanyasis standing on one leg for hours (for days and months according to hearsay) and I have seen Sanyasis with heavy wooden wheels around their necks. These crude methods are not approved of by most other Sanyasis. But I have encountered other types of vows. There are those who have vowed never to eat any cereal and live only on fruits. One Swami Ramdas, who lived to the ripe age of 102, lived in the same cottage at 11,000 ft height ever since his Guru passed away 62 years earlier. Once he fell ill and needed an operation. His devotees had to fly the surgeon and his team by helicopter since Swami Ramdas refused to budge. There are others who take a vow to be on the move always since staying at one place encourages building up of emotional relationships. The discipline of sadhana and the 'pride' of successfully keeping vows certainly build up their confidence and convictions.

"Do you not ever worry, where your next meal is going to come from"? I asked one Sanyasi who lived in seclusion.

"I challenge God not to provide me food". "How dare he not", he seemed to be saying.

There was this weather-beaten Naga Sadhu, sitting on the roadside waiting for a vehicle to take him to Badrinath, as he was too old to travel on foot.

"How long have you been waiting"? I asked.

"Three days", he replied. "One of my devotees has trucks which regularly take food stuff up to Badrinath".

"How often do these trucks go", I asked.

"I do not know", he said.

"Why do you not take a bus"? I asked.

"I have no money", he replied.

I sat down with him and started conducting my interview. When I finished, I gave him Rs. 100/-. He chuckled. "See, God has provided". The magic is not that God provided through me. That could have happened by chance. The magic is his conviction that God will take him to Badrinath, somehow, sometime.

The way of Sanyasi

So what kind of people are these 28 - apart from what I have said till now. There is Swami Dayananda who is in his 80s and runs three Ashrams across the world. He is up at 4 am and sleeps at 11 pm. He delivers four lectures a day. Once he went for a meeting to Delhi from Rishikesh, a distance of about 250 km, returned the same night and delivered a one-hour lecture before he called it a day. "Do you not get tired of people around you all the time?" I asked one day, "Do you not sometimes crave for a private space"? "No, I do not have any private space or a private time", he answered. It seemed that he had completely lost a sense of separate self and identified totally with the whole of mankind.

Another Sanyasi who impressed me is Ramadev Pathi. He is not highly educated, nor erudite like Swami Dayananda. He does not speak English and has no foreign devotees. But he also spends at least 12 hours a day with people, listening to their woes, telling them instructive stories or just laughing with them. People just come from anywhere to spend an hour, a day or a month at his place. He never asks when they intend to leave. He is skilled in using one person's skill to help another person. As soon as I arrived at his ashram, he got me busy seeing some sick people. He asks the well-to-do people to find jobs for the poor. Some find work in the *ashram* – against payment – as long as they stay. I saw him giving filial love to a boy who had recently lost his father

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and playfully asking a woman, who had come to complain about her husband, to mend her own ways first. He also seemed totally available to every one.

All of them exhibit high energy, cheerfulness and sense of public service. The Sadhu, who lives alone at 15000 ft height, first heated up water to soothe our tired feet and then got going with cooking some 'Dhal' and 'Roti' to feed us. Everything was done with good cheer and a smile on his face.

"Swamiji" I asked, "Do you not get lonely in the winter months when no one can come up to be with you"?

"You see, I am a man with *ladoos* in both hands". When people come, I eat 'ladoos' from one hand – by serving them. When I am alone, I eat ladoos from the other hand – the ladoos of my communion with God". Saying this, he laughed out loudly and then proudly posed for photographs in his loincloth, while we were bundled up in warm clothes against the cold.

Where does this happiness, energy and love for others come from? From being free in every sense, I believe – no possessions, no worry for food and, most importantly, no sense of separate self. This is what in my opinion is the source of the boundless energy and almost childlike laughter, which bursts upon the visitors time and again.

"Do you have any special powers", I ask them. Some laugh it away. Some make jokes.

"Yes, I can make very good *rasam*", one of them replied. I have not, in the last 20 years, met anyone who claims to have any powers, which defy the laws of science. Of course, I have met people who have met others that have seen these powers! I can only talk of my own experience.

Regarding my endeavour to find potential schizophrenics amongst the Sanyasis, when I put the question, all of them were very clear that they do not accept mentally disturbed persons as disciples. There is a strict weeding out process, which keeps the unstable away from the rigorous discipline of a Sanyasi.

But finally, I did see a person who lived in the Ashram and who to my professional eye appeared to be a schizophrenic. He was clad in

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dirty clothes and he was talking and laughing to himself. Apparently, he had been in the ashram for many years. He was an army captain, who went through some family crisis and became a Sadhu. Initially he was very active and used his education and army training for the service of the ashram. Slowly, he withdrew himself and now he does not talk to anyone. If any one tries to talk to him, he starts abusing them. Every one in the ashram treats him with great respect. "But he is mentally ill", I said to the ashram head. "No, he is lost in God. He does not need us. He is beyond us".

I suppose the generally acceptable criteria regarding mental illness do not apply once one has become a sanyasi!

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Collective wisdom: Some Indian experiments

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Neither the authors of the Vedas nor the processes in which they were reduced to the present form are known to us. Labeling the Vedas as *apauruseya*, or of divine origin, and parrying questions relating to their origins and authors may mean escapism, but unfortunately, the situation stands there nearly unaltered for the last two millennia.

The view that an estimated hundred thousand verses found in the four books of the Vedas were not composed by one individual and that they were preserved for generations only in memory has been more or less accepted now. Though learnt by rote and preserved in memory for centuries, these verses are stated to have remained unaltered; but the process in which this remarkable feat was achieved has been beyond the comprehension, if not of speculation, of generations of modern scholars.

It appears plausible that this repository of Indic wisdom was a result of the collective effort, though how many wise men were engaged in it and for how long are unascertainable. However, we have some other examples within the reach of history, which could be explored fruitfully, not so much to help solve the questions relating to the Vedas as to understand the Indian process of collective intellectual exercise.

I pick up two examples from the history of the first millennium of Peninsular India. The first is a body of Tamil literature named *Sangam*, commonly assigned to the first couple of centuries of the Common Era; the second is a manual on poetics called *Kavirājamārga*, composed in the 8th century Karnataka. Being the earliest body of Dravidian literature, the former laid the foundation of the philosophy of literature in the Tamil language; being the earliest of the surviving texts in Kannada language, the latter laid a similar foundation in the second oldest Dravidian language. Because of the innovative methods of their compilation, these are hailed as landmarks in the history of South Indian literature and are recognised as milestones in the intellectual journey of ancient Indian thinkers. Though distanced from each other in time and space, they bear out the collective social and intellectual consciousness of their times.

I. Śangam Literature

The literal meaning of the term Sangam is 'Academy' or 'Fraternity'; in the early Tamil context, it meant a league of identical fraternities of poets, with their centres located at the seats of power of three great Tamil ruling families (*mūventar*), namely the Cola, Pāndya and Cera.⁽¹⁾ The term Sangam was apparently borrowed sometime in the 7-8th century from the Buddhist (perhaps Jaina) parlance and applied to this loose-knit fraternity of poets who had converged on the banks of river Vaighaī.⁽²⁾ To begin with, this fraternity was known as *Kūdal*, meaning a 'confluence'.

The beginning and the total time-span of the Sangam movement are still unsettled, but it appears to have reached its watermark about two thousand years after the Vedas were formalised. If we have to locate this period from the known evidence of Indian history, it should be at the time when the Neolithic tools were becoming antique pieces and the Megalithic tombs a craze among South Indian inhabitants, and nearly the entire country, north of the Venkatadri, was transacting corporate business in the Prakrit language. The Sangam poets could have been aware of not only this popular Indian language, but also the Sanskrit language which enjoyed a high status among learned priests, but they preferred to address their immediate kith and kin only in the medium familiar to the early Tamils. Like the Vedas preserved in memory, the Tamil bards too chanted their compositions drawing it from memory for some centuries. This, perhaps, explains the reference to the 'unfailing tongue' in the Sangam poetry. The Akaval, one of the chief meters employed in this poetry, is known to have been derived from a verb akavu, meaning 'sing', 'summon' and 'call like a peacock'. The other striking parallel between the Vedas and the Sangam literature relates to their authorship. While the entire body of the Vedic literature is hailed as of divine origin, or apauruseya, a section of the Sangam poetry called Akapporul is claimed to have been handed down by Naivanār or Lord Śiva.⁽³⁾
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The central Sangam fraternity is stated to have met in an impressive hall (pattii-mandapam) established by one of the Pandyan kings on the banks of the Vaighī river. This mandapam comprised a hall, with doors to offer or deny entry to it. It is obvious that without the required creative and scholastic attainments, one could not become a member of this fraternity; as such, it should have been a dream-cometrue for the budding poets of the time to be accepted by this august body. From the meager evidence at our disposal, we learn that the standing membership of this academy was about six hundred at a given period of time. The works of four hundred and seventy three poets, which have survived the vicissitudes of time, bear the names of those who composed them; the rest bear no names. There were thirty nine poetesses who authored not less than one hundred and eighty one poems.⁽⁴⁾ About 2,381 verses (totaling up to thirty thousand lines) have survived to the day. The most prolific of the Sangam poets who was revered most was Kapilar. As many as 127 of his compositions have come down to us. It is interesting to note that about 50% of the surviving literature goes to the credit of six great poets, while about 293 poets appear to have succeeded in getting not more than one of theirs poems approved by this fraternity.

The World of Poet-Scholars: Poets, who occupied as important a place as warriors in the Sangam society, are grouped under a dozen heads, such as (1) specially gifted poets of spotless character and moral values; (2) gifted persons; (3) not-so-gifted for poesy; (4) skilful junior bards; (5) immature novices of simple words; (6) budding poets 'of simple heart'; (7) minstrels and songsters; (8) female bards 'of refined nature', and (9) female minstrels.⁽⁵⁾ Almost any creative individual could seek and secure gifts and largess from rulers and chieftains, but not many of them could secure membership of the Sangam fraternity. In fact, the gifts thoughtlessly lavished on the mediocre by the royal patrons seem to have caused some concern among the privileged poets of the time. One of the latter openly complains against those patrons who could not distinguish the undeserving from the deserving.

'Those who suffer from the pangs of poverty flock to the wealthy lover of poetry and receive gifts with little effort', he bemoans. 'Doling off presents in equal measures among all callers is unfair', according to him 'as that would not reveal his discernment of *the subtle art of creative poetry*'. 'What is rare indeed is the ability to recognise the talent, to assay, to measure, to plumb the depth of poetic genius and 'give in step with the measure of greatness' which is, indeed, 'a rare talent and the acid test of patronage', we are told further.⁽⁶⁾

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The Sangam fraternity formed a class by itself. While some took pride in being honored in the courts with pots of gold, vast stretches of land, positions, vehicles, etc., some others showed indifference to such material gains. 'O Kadungo! I do not seek your patronage...; I shall not flatter, nor disparage your fair renown. I come to see you, O Kadungo, drawn by the fame of your generous mien', announced one of them to a ruling king.⁽⁷⁾ When poet Palai Gautamanar was asked by his patron to seek a reward, he sought neither gold nor grants, nor positions nor privileges, but asked the king to help him perform a ritual sacrifice to enable his wife and himself to attain spiritual salvation. There were some others who attached less importance to the wealth they received from their patrons and more to the words of approval from the members of their fraternity. 'Poets are a unique tribe', says one of the greatest of the poets of this time. 'They travel long distances to meet a patron of art and spend long hours in his company discoursing on the great merits of their newest brainchild. Overwhelmed by their poetic art, when the patron smothers them with generous gifts, they care not to preserve them for the rainy days, but share it all immediately with their penniless ilk, for they 'only care for words of praise from mature men of discernment, from the dilettante of poesy, and not for wealth'.

Some poets went to the height of claiming equality with the king, assuming that they too were as 'wealthy, great and noble' as were their rulers.

"In their gifts of bliss and of love And the rarest gift of independence Know this then, O mighty king They are as wealthy, great and noble As are the crowned kings. In all ways are these poets, As high and mighty as kings like you"⁽⁸⁾

The poets received gifts not only from the great Colas, Pāndyas and Ceras, but also from chieftains like Pāri, whose 'unerring eyes could spot the specially gifted men of spotless conduct and moral values'. The kind of largess received by them appears to be beyond belief. For example, one of them is stated to have obtained five hundred villages besides a share in the revenue of the southern part of the country, while another claims to have received forty lakh gold coins and governing rights over a part of the kingdom; yet another is stated to have been rewarded with the office of the Minister.⁽⁹⁾ There are frequent references to gifts of chariots and elephants and as frequent references as these to the bartering of precious ivory (received from patrons) for pots of liquor. The kings not only shared their treasures, but also their table with them. The meal-spread out to entertain them was large and lavish. It comprised red or white rice, slabs of spiced meat grilled in melted butter, vegetables, chutney and several other side dishes. The feast was invariably accompanied by pots of liquor.⁽¹⁰⁾ Neither too small nor too large, these goblets were specially designed to retain the right degree of warmth. Though constantly replenished, it was not easy to maintain their brim-lines, according to an account.⁽¹¹⁾ The poetesses and female minstrels were not excluded from this kind of privileges. They too shared the royal table and offered a challenge to the tavern attenders who were struggling to maintain the brim line of their goblets.⁽¹²⁾

While mourning the loss of her patron in a battle, Avvaiyār, one of the celebrated poetesses of the time, recalls the bounty of her deceased patron in the following words:

"When our chief had but little store of palm-wine, he gave it all to us. When he had it in large store, he shared it with us in great rejoice, listening to our recitations in equal joy...When he had a large stock of food, he shared it all equally in numberless plates... He let us stroll at will on his vast land where much luscious bone, thick with meat, was found in abundance... Often he gently stroke and smoothened my foul-smelling hair with his perfumed fingers ...[His death] cruelly pounded the tongues of poets skilled in choicest words of beauty and power. Alas! I know not where my lord and protector is [resting] now...'.⁽¹³⁾

The prosperity enjoyed by poetesses was reflected by their rich attire and ornaments received from their patrons. Their glossy tresses are stated to have been turned into a pretty bun and decorated with flowers, jewels, wreaths and leaves, while their forearms bore rows of bright bangles and their bosoms, necklaces of shining gems. Poetess Naccellaiyar was endowed not only with nine measures of gold and one hundred thousand gold coins, but also with a chair next to the king in the Cera court.⁽¹⁴⁾

Sangam Symposia: As the works presented before the Sangam fraternity were rigorously scrutinized, any piece of poetry which

received its approval was proudly paraded by its composer. Even if a single poem was commended from among the life-time compositions of a bard, it was welcomed with joy, because that ensured him or her a career of plenty and prosperity in society and court. We have noted already that as many as two hundred and ninety three poets could not get more than one of their poems approved by the fraternity.

As the poetry of this period falls into definitive patterns, in meter and matter, we may presume that the first requirement of every aspiring poet was to conform to the standard manuals and style-sheets approved by the Sangam academy. This explains why this vast body of literature thematically falls into one of the two groups, *akam* and *puram*, and nearly all of it adheres to the rules of poesy laid down in the *Tolkāppiyam*.⁽¹⁵⁾ The rules of length and lines of one *genre* of poetry could be relaxed only to accommodate another *genre* of poetry approved by the fraternity. This accounts for variations found in *Ettuttokai* and other anthologies.

When the Sangam fraternity accorded recognition to a poem, though after prolonged discussion, it was allowed to be identified in the personal name of the composer, but when it modified the original composition beyond recognition, it was probably considered unfair to give the sole authorship to any single individual, including the original initiator. One of the plausible explanations for the presence of more than a hundred anonymous poems in this collection could be found in this, for those compositions which lost their original identity during the debate and those which emerged out of the collective wisdom of the entire fraternity, could not be attributed to any one of them. This meant that the fraternity played an important role not only in mooting an idea and giving it a final shape, but also in polishing its literary expression and commending its excellence. Surely, scores of poems brought before it by junior bards 'though skilful', novices or budding poets 'of simple heart', senior but not-so-gifted poets, female minstrels and songsters, went into oblivion, being dumped into the waste bin of the Debating Hall. The importance attached to this can be made out from the fact that apart from what has been approved by the Sangam fraternity, no other body of literature of this period has survived either in full or in footnote, despite such an intense activity of scores of poets, bards, minstrels, who are stated to have thronged to the court. It appears that the approved literary piece was meticulously entered into the fraternity ledger and carefully preserved by it, while that which met with disapproval disappeared into the thin air.

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One of the notable achievements of the Sangam fraternity is a standard manual on grammar and poetics; this pioneering work has survived to this day in the name of *Tolkāppiyam*, meaning Ancient Composition (however, it is also argued to represent the name of the author, Tolkappiyar). It comprises 1602 verses. Grouped under twenty seven chapters, it covers three major themes: (i) phonology and graphology (483), (ii) morphology and syntax (463) and (iii) semantics and prosody (656); besides these, it also deals with the literary concepts such as *akam* and *puram*. It is rightly called 'a multi-faceted work encompassing phonology, morphology, syntax, etymology. dialectology and semantics on the one hand, and poetics, prosody and rhetoric on the other, placing them all against the backdrop of life itself - life in man and nature. It also constitutes an introduction to sociolinguistics, anthropology and psycholinguistics, as much as it is a study of language, art of communication and pragmatics'.⁽¹⁶⁾ The intricate rules laid down in this text had to face a long-drawn and involved debate, innuendo and scholastic skirmishes, when it came up for discussion in the Sangam assembly. This episode is worth recalling here, as it throws light not only on the nature of the Sangam scholarship, but also on the forces which got a work accepted or dismissed.

At the time when the *Tolkāppiyam* was compiled, there were apparently some such manuals in circulation. One of them was Panampāran composed by Panampāran; the other was Akattiyam called after its author Akattiyar. Tolkappiyar and Panamparan were contemporaries in school, and perhaps both of them were students of Akattiyar. When Tolkappiyar presented his edition of Tamil grammar, his teacher is stated to have become envious of it, perhaps because he feared that it may undermine the grammar which he had authored and thus affect his status in the world of scholarship. This led him to instigate his another student called Atankottacan to do all that should be done to block its passage in the Sangam assembly convened by the Pandiyan king, Nīlantarutiruvirpantiyan, alias Mākirtti. Atankottacan raised 'several crucial and critical questions and stirring creative problems' and argued before the august assembly to censure the work, but Tolkappiyar is stated to have withstood this attack, 'smashed down diligently the riddles and squabbles put forth..., surmounted the hurdles', and in the end, convinced the Sangam fraternity to accord it approval.⁽¹⁷⁾ This episode not only reveals the factors that made Tolkappiyam a work of lasting importance in the Tamil world, but also on what drove out the Akattiyam into oblivion. Unlike Akattiyar, the

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other notable grammarian of the time became so much overjoyed by the decision made by the Śangam fraternity as to become its chief spokesman. Panampāran wrote an elaborate prologue ($p\bar{a}yiram$) to each section of the *Tolkāppiyam*, introducing not only the nuances of Tamil grammar, but also the versatile attainments of its author. This authoritative commentary is receiving respect from Tamil scholars today as much as it did during the last two millennia.⁽¹⁸⁾

The Sangam poets, unlike the Vedic bards, were concerned more with the here and the near, and less with the far and the beyond. They loved their land, admired its beauty and established rapport with it. They saw God in the human, though they were not unaware of the Force beyond the human comprehension. Their land comprised five types of landscapes (hill, sea, green field, wilderness and desert) conceived in the images of five flowers (plants or trees) such as the kurunci (the hill flower), neytal (blue lily), mullai (jasmine), marutam (queen's flower) and palai (desert bloom). They not only loved landscapes and made love in them going through the five emotional experiences: establishing union with the partner, suffering from the pangs of separation, awaiting endless time for reunion, longing to meet the lover in anxiety, and the last inevitable finale, enduring the lover's indifference or beloved's resentment. The union of lovers before wedlock, and the indifference or resentment nearly always past the marriage, were the realities embedded in their social psychology.

All that was composed exclusively on love by not less than three hundred and seven poets has been brought under a single *genre* called *akam* (*aham*); all that was composed on heroism by about eighty nine poets has been brought under another *genre* called *puram*. Only about seventy seven poets could mix with both these groups.

The core content of the collective effort of the Sangam poets was to make life purposeful on earth, make the art of love colorful and the existence meaningful even in death. There is no attempt to gloss over the human frailties; on the contrary, they offer solace to those who had to suffer because of the frailties of others. They did not believe in the idealised and schematised existence, nor in its total futility; on the contrary they firmly believed that life on earth was worth living. The king had to rule and rule properly, not only sharing his joy and suffering, but also his table and tavern with his subjects. These poets seem to have had an interesting world view. They admired the unity of

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nature and culture. Their life was patterned more on the model of changing seasons than on the vicissitude of material gains. Metaphysical abstraction is integrated in their thoughts, no doubt, but it is not drowned in speculations on the creator or the cosmos. No doubt, they had their gods and their kings, and there was no confusion about their relevance. God and king were equals or near parallels; hence their respective abodes, the temple and the palace, were identified by synonyms such as $k\bar{o}$ and $k\bar{o}yil$. In fact, their collective wisdom produced what was essential for making life refined and remarkable on this earth. In this respect, the Śangam thinkers differed from the Vedic thinkers. For this very reason, they appear to be far more relevant to the history of mankind than others.

These poets seem to have stored their physical and emotional experiences in memory before *sharing* them in words. In a sense, they built their history on the twin principles which their society valued most, war and love. This narrative is in the present tense. The akam poetry does not recognise any individual by name; the he and she, whom we crisscross in the by-lanes of five landscapes, offer us no individual genealogy and chronology, as in the narrative history of our times. He represented the entire male and the she the entire female. Even where they speak in the first person singular, all that they recount is not merely of his own or her own, but of all theirs in general, of the entire society, entire land and entire time. These are common truths, because they are based on common experiences. In this sense, the Sangams appear to be among the first to make an attempt to write the history of a community and to secure a place for the non-entity in its folds. We hardly encounter in his narrative the kind of personalised picture-portraits, as we do in the historical biographies of the poets of the Classical Age. In the entire range of Sangam love poetry, the heroine appears and reappears before us, never ever parading her heaving breasts and swinging hips, her wobbling waist and wandering eyes. She has a face, but it is not the moon-incarnate. She is beautiful within. Her ebbing emotions are not indexed by her undulating breasts, but by her withering shoulders and slipping bracelets. As on the rock, bruisings of cave-man and on the canvas of post-modern painters, the figures emerge without mounted limbs, the face without eyes, the mouth without lips and the nose without nostrils. In other words, we have to search for the physical assets of her in the akam poetry, though she is a woman possessed of passion and drowned in love.

II. Kavirājamārga

We have to move to the 9th century Karnataka, which was then the heartland of the Rāstrakūtas. This royal family is better remembered today for two of its great gifts to the country: one, an amazing rock-cut named the Kailasa temple at Ellora; two, a monumental literary work on poetics called *Kavirājamārga*. The latter means both *The Royal Highway of Poets* or *The Highway of Royal Poets*.⁽¹⁹⁾

This manual in ancient Kannada was composed in the court of Nrupatumga, who ruled during the major part of the 9th century. The work comprises elaborate rules of literary and cultural exercises which incidentally also include the prevailing ideals and values of life. The rules of composition were not laid down by the king single-handedly, issuing royal edicts from the seat of his power (as was done by the Great Mauryan king Asoka on the *Laws of Dhamma*), but were evolved collectively through an ingenious method of counseling with a number of learned men.

We have no direct evidence to know how many scholars were involved in this Literary Symposium and for how long, but it appears that apart from linguists, grammarians, scientists, artists, poets and philosophers, the most outstanding Samskritists, Prakritists and Dravidologists were also included in it. It proved to be a unique experiment, for there is no other instance in the history of the ancient world which shows the royal concern for the art and science of creative expression as intensely as this; it also happens to be the first attempt in our history at meticulously demarcating the broad boundaries and the core areas of a linguistic state and to give an identity to the inhabitants of the land, who probably had little sense of it.⁽²⁰⁾ The scholars who assembled in the court of Nrupatumga (1) defined the geographical area and identified the character of the people who spoke, though differently, the Kannada language and reminded them of the strength and weaknesses in their composition and character; (2) debated the art of composing poetry, emphatically reminding who should attempt it and who should not; (3) reiterated the need for evolving a standard manual on the models of those that existed in Sanskrit and Prakrit, but without losing sight of either local and regional needs as well as linguistic practices in extant; and (4) provided an in-depth insight into the *desi* and *margi* practices as well as the process of borrowing and blending the words from the classical languages.

Their main goal was to secure Kannada language the 'epistemological status of Sanskrit' and the dignity of its philosophical apparatus, 'The text itself', comments a modern critic 'is moreover a performance of its arguments, for it constitutes Kannada as a language of science in the act of establishing Kannada as a language of literature... This text defines virtually the whole range of literary themes that will be meditated over for the next four or five centuries, everything from the large question of genre and the construction...of a canon of Kannada prose and verse poetry juxtaposed to and contemplating that of Sanskrit, to the structure of compounds and the micro-analysis of which Sanskrit and Kannada may and may not be joined in compound. Such negotiations are not just theoretical, either. They inform the literary procedures of the poets themselves over a whole range of texts, whose very titles bespeak the localisation of the Sanskrit global, and suggest that a big part of what early Kannada literature is about is the very possibility of making literature in Kannada'.

Professor Sheldon Pollock places Nrupatumga's Kavirājamārga along Dante's *De vulgari eloquentia*, the latter four centuries junior to the former, and reminds that the former is 'the first work in world culture to constitute a vernacular poetics in direct confrontation with the cosmopolitan language'.^(20a)

The 552 verses in this text bear the imprimatur of the royal poet, Nrupatumga, perhaps to mark the final ruling on the discourse held on several literary issues. This was apparently felt necessary, for otherwise, scholars who are generally in love with their voice would have dragged on the debate for aeons only to produce inconclusive conclusions. The king apparently knew this weak point in the scholarly profundity and took on himself the responsibility of giving a direction to the debate and a definitive shape to the collective consensus. This is amply borne out by statements such as '*nrupatumgadeva-anumatadol*', or 'in the discretionary view of Lord Nrupatumga', abounding in this text. We shall return to this later.

The commitment to writing of what emerged in the debate and what was finally approved on behalf of the assembly by the presiding persona was, no doubt, a challenging task, for one who was entrusted with this had to capture not only all that had gone into its making, but also the core of the conclusion in as few words as possible. Quite often, in a debate, the participants end up without a clearly spelt out conclusion and, on such occasions, the onus of capturing this

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inconclusive conclusion falls on the presiding officer or his amanuensis. King Nrupatumga seems to have handled this delicate issue with utmost sensitivity to obtain *Kavirājamārga* an enviable niche in the world of poetics. It should be a matter of considerable curiosity to know how this was achieved in the 9th century Lower Deccan, the home of Kannadigas.

The World of Poet-Scholars: The Kavirājamārga lists a dozen categories of poet-scholars who directly or indirectly helped enrich this discourse on poetics. Some of them were physically present in the royal seminar, while some others of yore were represented by their descendants and followers. Of these, the following deserve special notice:

Pūrvakavi and Kavivrsabha: The poets of the past-years or those who continued the established and age-old traditions are identified as pūrvakavi, purātanakavi and purānakavi. Their ways, (samtatagatamārga), concepts (cimtita...viditāmtaram), experiments (prayogāviļa-) and noble ideas (sadgunodayam) are recalled here in some detail.⁽²¹⁾ Close to, or perhaps overlapping with the above, were the kavivrsabhas. These pioneers carried the weight of scholarship with ease and ploughed the difficult terrain of poetics effortlessly. They were held in high esteem and revered like Lord Vrsabha, the first of the twenty-four enlightened, who showed the path of fording (tirthankaras) the ocean of knowledge and wisdom. Like the purvakavis, these rarest of the rare scholars are stated to have made several experiments (prayogamgal) and explored the philosophy of poetry (kavita-nīti). They also plumbed deep into the inner implications of percepts and arrived at incontrovertible conclusions (samkāvirahita-citta), built up the beautiful edifice of epic poetry (mahā-kāvya-pranayamanāgisida), cleansed expressions of meaningless babbles and made the magnificence of the mārga idiom glow resplendently.⁽²²⁾

Pandits and *Budhars*: Slightly removed from the above were the *pandits* or scholiasts and *budhars* or wise men. The senior-most among them were respected for their vast experience and dissecting mind. Being well-acquainted with the canons of poetics, the pandits were most skilled in detecting the pitfalls (*dosaman*) in a work and offering solution to overcome them.⁽²³⁾ The wisemen fell into two categories – the *budhars* (wise) and *budhottamars* (wisest of the wise). They heard compositions seeking endless clarifications (*bagebagedu-kēldu*), made

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clear of the principles of universal welfare (bhuvana hitamgal), interpreted and expounded (uktipurvakam) what had been approved by Nrupatumga (*nīti-niramtarānugata*), solved (*pariharikke*) knotty problems, passed judgements on interpretations and intent (arthamtaravinyāsa-bhedamam), so much so that society considered it a privilege to serve (budha-janopāsanamum) and safeguard (budhargotu-kāvan) them.⁽²⁴⁾ The pandits and budhars were apparently specialists in several branches of learning. Some of them were repositories of classical knowledge expounders and of the canonical texts (paramāgamakovidar). As thinkers (cimtitar) or philosophers, they were continuously seized with concepts and hidden intent (viditāmtaram). The outstanding intellectual assets of these wisemen (vivekigal) were skill, prudence, wisdom and discriminating mind.⁽²⁵⁾

Bhāşāvidhar and *Mātarivar*: There were two other categories of specialists who shared their erudition in the allied field of poetry; these were linguists (*bhāşāvidhar*) and debaters (*mātarivar*). The former could mercilessly expose the pitfalls (*dūsisugum*) found in a work before an assembly of specialists of all branches of learning (*sakala-vidvatsabheyol*), while the disputants could put across their arguments in a convincing manner.⁽²⁶⁾

Jānar and Ati-nipuņar: The pandits and the budhars were perhaps above those who were merely skilled composers. The latter are called jānar, ati-nipuņar, catura-kavigal, all of which terms mean skilled craftsmen. They may not be as learned (kuritavar) as budhars, but were shrewd enough to put across their thoughts in effective words (nudiyolellar-jānar), and were certainly superior to those who learnt by rote (pūnigars) and stored it in memory, hardly making out its true intent. The foremost of these skilled composers (ati-nipuṇar) alone could comprehend the high-path (māragakrama) of poetry as enunciated by Nrupatumga, the brightest of the bright (atisaya-dhavala) scholars.⁽²⁷⁾

 $\bar{A}c\bar{a}rya$ and Guru: One of the high podiums in the assembly hall appears to have been reserved for preceptors and masters, identified by terms such as $\bar{a}c\bar{a}rya$ and guru etc. The first of these being thinkers (*cimtanācāryar*), judges (*nigadisuva...ācaryar*), expounders of traditional knowledge ($p\bar{u}rv\bar{a}c\bar{a}ryar$), were held in high esteem and great reverence (*paramācāryar*) by the rest. Poetry sprang from them spontaneously, with least exertion and external aid (*akrtakācārar*). In other words, they were the every personification of knowledge, wisdom, talent, experience and creative propensity. The gurus were

teachers who specialised in exposition, interpretation and teaching. Though some of the gurus or masters were as erudite as the $\bar{a}c\bar{a}ryas$, they seem to have had limited creative skills.⁽²⁸⁾

 \tilde{O}_{jas} : Another class of teachers were \tilde{O}_{jas} (vuvajjā >upādhyāya) who, as a class, was below that of gurus but who, as individuals, received as much attention as *ācāryas* and *gurus*.⁽²⁹⁾ The majority of *ōjas* were teachers of local groups in the local idiom, and were, perhaps, men of limited attainments, but they too played an important role in imparting lessons in the elements of poetry and in spreading the knowledge at the grass-root levels. Being identified with the soil (nādavar-öjar), some of them were undoubtedly accomplished folk-poets, uniquely skilled in exploiting the local poetic forms and meters nearly unfamiliar to the classical poets. Two such idioms rooted in Kannada land and language of the time were bedemde and cattāna.⁽³⁰⁾ These were skillfully woven forms of poetry where the kamda, vritta and desi-cchandas were harmoniously blended in one of them and, retaining the preponderance of the kamda, reinforcing it by the akkara, caupadi, gītika and tripadi in the other. These unique experiments, believed to have been largely confined to the folk theatre and street performances in the beginning, were raised to such heights (sargabamdhakrti) by the ojas as to make their original tongue-twisting local labels to be replaced by high sounding nomenclatures such as vaidumbika and citravana in subsequent periods of time. These nād-ojas too had their pūrvācāryas, because the history of this literary tradition was also of considerable antiquity. These *pūrvācāryas* were not only the founders and pioneering promoters of the desi, but also the ones who secured a respectable place for the khamdaprāsa or split-rhyme (at the beginning of each line) and to the yati (variant from Sanskrit) or beat (pause). Their image conception (vikalparūpa) had a bearing with the special needs of the sub-region. All these appear to have helped produce different hues of *desi* and procure them a respectable place in the world of poetry. Even among the *nād-ōjas*, there were at least two categories - those who expressed in chaste and sophisticated language, settled in the core zone of the Kannada country, and others who were scattered beyond the core zone but lived between the rivers Kaveri and Godavari and wrote liberally using the native imagery. The former were open to contemporary and current ideas, while the latter, being very conservative, preferred the age old idiom, though they faced the accusation that their expressions were debased.⁽³¹⁾

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Bards, Composers and Other Creative Individuals: The creative individuals were divided into two broad groups: (1) those who had already earned a place in the creative field, and (2) those who were aspiring to gain this place and were heading towards it, hindered or unhindered. The suffixes attached to the root term kavi (kavisvarar, kavipradhanar and kavimukhyar), no doubt, indicate the high position they had acquired. Probably in recognition of this, they were addressed reverentially (parama) by others. These were competent to offer suggestion and advice (aripugum), understand and interpret (aridu, bagedu, tarisi) and also make fresh experiments (prayoga) at will. They were known for their knowledge in upamā-krama, laksya-vicāra, madhyantvyāpaka-vikalpalaksyalaghudosa mārga-dvitāvagati, and such others; they were also fully aware of the height to which the poetry could scale. The majority of poets who were struggling to rise up the ladder, however, seem to have had none of these distinctive attributes.⁽³²⁾

As if to dissolve all these groups, because they were not isolated or rigid categories, another suggestion has been made here to identify four distinct types based on their experience and innovative capacities: (1) those who grasped expression (mātarivar), (2) those who were skilled enough to express profound thoughts in fewer words (nerevāta...jānam), (3) those who were more intelligent (arivāta...jānam) other than former, because they were capable of setting expressions to meters, and (4) the last ones who knew all (ballam =lit. all knowing) and who were capable of composing epic poetry (mahadvakrti) with utmost ease (tadeyade). The second was regarded more skilled than the first (*ātanimdam jānam*) because he could convey profound thoughts in very few words (kiridarol*piridarthanam-aripa*); the third ones were better skilled (*jānam*) than the second, because they could set expressions to meters (nudiyam-ccamdadol-omdire), but the profoundest of all (ellarimdam-ballam) was the one who composed epic poems (mahādva-krti) effortlessly (tadevade).⁽³³⁾

The Assembly of Poets: To enter the cultural metropolis of the Rāstrakūtas and the literary court of Nrupatumga, a poet-literati was required to possess some distinctive attainments. The qualifications of the former are laid down briefly in a single verse, while those of the latter are elaborated in as many as thirteen verses.⁽³⁴⁾ Why should any one who is indifferent ($vy\bar{a}kula$) to the nuances of grammar, poetry, play, philosophy, rhetoric, arts and the knowledge of the universe, we

are asked, aspire to step into the city of the Guru of the wisest of gurus (vivēka-brhaspati)? Scholastic proficiency was demanded not from the commoners who frequented the metropolis for transacting various other kinds of businesses, but only from the literati who reached the capital to participate in the Court Seminar. The attainments required of those who sought seats in the assembly hall (sabha) were (a) a thorough knowledge of (krta-paricaya) and abiding interest (satatam) in the experiments (prāyogamgaļam) made by the great poets (kavivrşabhar) in the past: (b) understanding of all sacred texts, material world and philosophical theories (laukika-sāmāvikoru-vaidika...pārāvanam) and the ability to expose or interpret (prakatitokta) the science of literature (sāhitya-vidyāa): (c) possession of profound, lively or quick mind (mahā-catura-vritti) which could digest (prtibhā-vibhāva) not only the canons, but also the illustrative instances (laksna-laksyam).⁽³⁵⁾ 'On careful examination, we realize that they (who were admitted into the court-assembly) were truly wise (janan), well-versed in all aspects of linguistics; devoted to the services of the gods, gurus, virtuous as well as elders, and conquerors of all undesirable cravings (apakrta-vaikrtacapalam).⁽³⁶⁾ They were also kind and un-envious of the virtues of Agamic scholars. They were free from all defects. They commanded respect from all those who believed in the efficacy of *dharma* or the sacred law'. (37)

When Nrupatumga, the ruling king of the time, learnt that the land on which he was ruling had a language of considerable antiquity, literature of some respectability, and subjects of immense talent and attainments, but no manual of poetics matching those in Sanskrit and other classical languages, he felt it his duty to secure a similar manual for his talented subjects, for without such facility, a disciplined development of the native (desi) talent was hard to come by. Along with his literary counselors, he seems to have prepared a draft of the manual, summoned the wise men of the time to deliberate on it and to evolve an acceptable text. The outstanding issues which engaged the attention of those who congregated in the Literary Court of Nrupatumga were as follows: the role of the language in cultured society, its native (desi) and national (margi) characteristics; proper forms of poetry; antiquated and contemporary usage and the manner in which these are to be respected or rejected; the art and science of borrowing and blending words from classical languages; the character and nature of the rhetoric, southern and northern traditions, violation and observance of compounds, rules of grammar, rhyme, emotion and

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such other literary and linguistic issues. Underlying all these was a deeper concern for identifying the character of the people, the configuration of the land and the complex layers of Kannada culture.

For how long this deliberation lasted cannot be made out, but there is little doubt that every issue was discussed threadbare for a prolonged period. The deliberation had to be wound up by the presiding officer at some point of time, so that the collective consensus could be translated into words and verses. The task of capturing this in a refined literary idiom was no doubt a challenging job, but, fortunately, Nrupaturnga seems to have found a scholar in the assembly who could ably shoulder this responsibility. This poet-scholar is described to have been given a seat in the center of the assembly (sabhāmadhyalabdhāvaram) by the king, so that he would miss none of those present and nothing that happened in the assembly. Fortunately, later chroniclers have provided a clue for us to know that he was none other than the poet, Śrī Vijaya, who also figures in the Kavirājamārga.⁽³⁸⁾ The responsibility of calling deliberations to a halt and providing a summary-conclusion of the collective consciousness seems to have fallen on the presiding officer who was none other than Nrupatumga himself (for, as the ruling king of the temporal and literary world, he alone could exercise effectively such an authority), but the refined manner in which the minutes were to be composed seems to have fallen on the most competent and the wisest of the assembled poets, Srī Vijaya. The collective wisdom was unanimous no doubt, but had it also been anonymous, it would have lost the weight which this text gained, when it received the imprimatur of the king poet. However, this led later scholars to wonder who could have been the real author of the Kavirājamārga from among the three names which figure in the text -Nrupatumga, Śrī Vijaya and Kavīsvara?⁽³⁹⁾

Notes and References

1. The one located on the Vaighaī river at Madurai, which was the seat of power of the Pandyas, seems to have been better known than the rest. However, the exact number of the Sangams (apart from the traditional three Sangams) and their locale, are not easy to make out. Like the three royal families, the chieftains also maintained separate Sangams, each at his seat of power, but details about them are not made explicit. Most poets seem to have stuck to the court of one of the Sangams or one of the patrons, but some certainly moved from one to another, for varying periods of time. The major part of the Puram poetry was obviously composed in royal courts, to

panegyrize their royal-hero exclusively; in such centers, the poets could not have composed poems praising the qualities of the kings of other dynasties, save the chieftains loyal to them. This is made clear by the *Patrrupattū*, which is devoted to the Cera kings. As the Sangam fraternity prevailed for about a half millennium, we may surmise that it produced a staggering quantity of literature. What we have today appears to be only a fraction of it and only that which could be recovered in the 19th century, thanks to the effort of a dedicated Tamil scholar.

- There is also the view that cenkam is no more than a synonym of the Sanskrit word sanghāta, denoting a collection of poems arranged artificially and analogous to the Vedic samhitās – Marr J R, The Eight Anthologies, Madras, 1985, p.13.
- 3. Ibid., pp. 3-4.
- 4. Appuswami P N A bunch of essays on Tamil literature, Chennai, 2002, p.6.
- Subramanian A V, *The ten decades (Patirrupattů)*, II, 15 (p. 8), IX, 86, (p. 82), VI, 51 (p. 48), IV, 40 (p. 35), IV, 40 (35), V, 43, (p.40), V, 43, (p. 40) respectively.
- 6. Subramanian A V, The squirrel in the courtyard: Translation from Tamil Sangam Lyrics, (Tirunelveli Saiva Siddhanta Works Publishing Society Ltd., here after, TSSWPS, Pub. No. 1191, Madras, 1980, verse no. 952, pp. 75-76). At the same time, the king's selfless generosity 'to give without stint', to 'give till it hurts', not making munificence a 'spiritual commerce' or to acquire merit in life after, is also emphasised, though this may have been to the deserving. A poet says, 'You give because your forebears gave/ You give because that is the only way men of noblest mien react every time they are face to face with the fleshless visage of penury. *Ibid.*, 71, p. 80; No. 341.
- 7. The ten decads, 63, p. 58.
- 8. Cf. Subramanian A V, op.cit., No. 70, p. 78; TSSWPS., No. 1212.
- 9. See 'Pathakam' (Preface) to each of the Decads for the varieties of grants received by great poets who composed *Patirrupattu*.
- 10. Ibid., II, 18, p. 11; III, 21, p. 16; 24, p. 20.
- 11. *Ibid.*, 43, p. 41. Another poet refers to a meal of rice, fat steak and a chutney obtained from ground gram with pieces of red meat in it *Ibid.*, VI, 55, p. 51.
- 12. Ibid., II, 18.
- 13. Puranānūru, 235. Cf. Appuswami. P.N., op.cit., p. 9.
- 14. Ibid., V, 46, p. 43, Il, 15, p. 8.
- 15. However, violating this rigid format, perhaps one could combine these two in a work of ethical and didactic fields such as the 'Eighteen Minor Works'.
- 16. Murugan V, Tolkāppiyam in English, Chennai, 2001, pp.IX-X.

- 17. See, Kandaswamy S N, *The Tamil Literature and Indian Philosophy*, Chennai, 2001, pp. 47 ff.
- 18. Ibid., pp. 48-49.
- 19. Nrpatumgadvānumatam-Šrīvijayaprabhūtam-Kavirājamārgam, ed. by K. Krishnamurthy, Bangalore, 1983 is the latest and one of the most standard editions and this text is followed here. But the discovery of this text goes back to the time of H.H. Wilson (1828), and a serious notice of this text to the time of B L Rice (1890), though the full text was edited and made accessible two years later by K B Pathak (Nrpatumga's Kavirājamārga: A treatise of the 9th century on Alamkara, Bangalore, 1982). This was followed by the Kavirājamārgam, ed. by A Venkata Rao & H Sesha Aiyangar (Madras, 1930) and Śrīvijayakrta –Kavirājamārgam, ed. by M V Sitaramaiah (Bangalore, 1968, 1994). This text has also attracted the comments of some veteran scholars, of whom Muliya Timmappaiah, Bhimarao Chitaguppi and M M Kalaburgi deserve special mention.
- 20. The earliest attempt of this kind may be found in the Sangam work *Tolkāppiyam*, but the demarcation of 'the virtuous Tamil speaking land' extended 'from Venkatam in the north and Kumāri in the south' is to be credited not so much to Tolkāppiyar as to its commentator Panampāranar, for this remark occurs in the Prologue written by the latter. V. Murugan, *op.cit.*, p.23. Unlike this, the path-setter (*mārgakāra*) of Karnataka, besides making several casual comments, critical and complimentary, devotes seven verses to define the Kannada speaking land, its core area, the character of its people, their moods and manners, etc., *-KRM.*, 1-32, 36-42; also see 3-219 to 231.
- 20a. S Pollock, "The Cosmopolitan Verracular", Aniketana: A Journal of Kannada Language and Literature, (Bangalore 1999), Apr.-Sept. pp.20ff
- 21. KRM., 1-33,47; 2-1,51,55,143, etc.
- 22. *Ibid.*, 1-5,17,31,78;2-95;3-157. This is indeed a rare attribute of poets and appears to have been first popularised or probably coined by the author of the *KRM*; later this term seems to have been replaced by an equally meaningful term, *kavikēsari*. However, the latter term does not occur in the *KRM*.
- 23. Ibid., 1-32,113, 139-40.
- 24. *Ibid.*, 1-11,13,20,47,87; 2-68,154; 3-37, 228 for *budhars* and 1-11,13,20,47,83; 2-68,101,154; 3-38,228 for *budhōttamar*.
- 25. Ibid., 1-9, 27;2-51.
- 26. *Ibid.*, 1-17,100.
- 27. Ibid., 1-39,40,45; 3-107; 2-153 respectively for janar, atinipunar and catura-kavigal.
- 28. Ibid., 1-27,75; 3-205.
- 29. Ibid., 1-42. They are explicitly stated to be not as skillful as the purvācāryas purvācāryaravoļ saitirisal-ariyar kannadakke nādavar-

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 $\bar{o}jar$ (*lbid.*, 1-42.). Two elements of considerable discomfort caused by these poets were: one, their experiments were so prolific and so perplexing as to make it impossible even for the thousand tongued $\bar{A}dis\bar{e}sa$ to cope up with all of them; two, they stuck so doggedly to the outdated mode of expression that it reminded one of the emotional infatuation of a paramour who was persisting with an aging woman.

- 30. Ibid., 1-33 to 35. For a summary of arguments made during the past hundred years by various scholars, and to the reflections of the medieval poets who succeeded the author of Kavirājamārga, see, Kalaburgi, M M, Kavirājamārga parisarada Kannada Sāhitya, Dharawad, 1973, pp.54-70.
- 31. Ibid., !-36 to 38.
- Ibid., 1-18,24; 3-58; 1-19,129;2-48,49,98; 3-58,91,154,199 for kavipradhānar, kavimukhyar and kavīšvarar; 1-12,22,26,49,76,87,125,141 for kavi and kabbiga.
- 33. *Ibid.*, 1-6,15,16. 34; 3-219 to 231.
- 34. Ibid., 1-6.
- 35. Ibid., 1-5.
- 36. Ibid., 3-221.
- 37. Ibid., 222-224.
- Madhura's Dhramanāthapurānam, cited in Karnātaka Kavicarite (Bangalore, 1961), p.486. Cf. M M Kalaburgi, op.cit. (Dharwad, 1973), p.28 ff.; KRM., 1-150;2-155.
- 39. Somewhat connected with this is another question: whether these three terms were indicating three different poets or one and the same person in different terms? If this manual was an outcome of the collective wisdom of all those who participated in the debate held in the literary court of the Rāstrakūta king, one may think that there was no need to mention any single individual, but in this particular case, there seems to have arisen a need of this kind. This first book on poetics in Kannada language had to be issued by an authority which was universally respected in the monarchic order of the Rastrakuta times, if it were to become a standard manual. Similarly, the name of Srī Vijava, who codified the rules approved by the assembly and pronounced by the presiding officer, in fewer words of poetry had to be acknowledged in appreciation of his skill. This means that, while the thoughts were an outcome of the collective efforts of an assembly of poets, the verses in the text (minutes) were the handy work of poet Srī Vijaya. The remaining term, Kavīsvara, appears to be more an attribute than a personal name.

Consciousness

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Platonic ideals and the real world

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1. Three worlds and their connecting mysteries

We have become accustomed to the enormous changes that advances in technology have made to our lives, over the past several centuries. These advances owe much to careful observation of the workings of the world, to ingenious experimentation so as to reveal these workings at ever deeper levels, and to clever technological exploitation of some of the results of these endeavours. But they depend also on the huge strides that have been made in our profound mathematical understanding of the world in terms of the accurate laws that seem to govern the behaviour of all physical things. This understanding could not have come about, had it not been for the remarkable fact that physical behaviour actually accords with the enacting of certain mathematical procedures to an extraordinary precision. Not only this, but also there is the fact that these mathematical procedures are of such a kind that human sensitivity and ingenuity has, so far, been sufficient to comprehend their broad principles, in good measure, if not always their detailed implications. As had been forcefully remarked by the outstanding 20th century physicist Eugene P Wigner (1960), this reflects "the unreasonable effectiveness of mathematics in the physical sciences".

To me, this is one of the profound mysteries of physical existence, and I like to express this graphically in terms of the relation between two "worlds", as depicted in Figure 1.

At the top, I have represented the "Platonic world of ideal mathematical notions" and to the right, the "world of physical things". Although some people are reluctant to accept the idea that mathematical entities can have any actual existence beyond being mere

of mathematicians' minds, it is common for constructions mathematicians themselves to regard the objects of their professional concern to have a kind of existence of their own, which is as real as that of ordinary physical objects, though of a different kind, so that there is no actual spatial or temporal location for mathematical entities. Mathematical truth, after all, is completely independent of the physical location from which it is perceived, and is an utterly timeless and objective thing on its own, subject to no alteration with the passage of time. To find a deep mathematical truth is thus to be viewed as an act of discovery, rather than of invention. Although many find difficulty in accepting an independent "reality" for these ideal mathematical entities, this Platonic existence is, to me, merely an assertion of the objectivity of mathematical truth. Moreover, without some kind of independent existence for this Platonic mathematical world, it is hard to see how the physical world itself could - apparently since the beginning of time have accorded so precisely with particular mathematical laws, laws which must have been operative long before there were any human or other animal observers.

Nevertheless, mathematical truths are conceptual entities, and they need the existence of conscious minds in order actually to perceive



Figure 1: Three worlds and the three mysteries connecting them.

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them. Accordingly, in Figure 1, I have depicted a third world, namely the world of conscious mentality, where I have indicated this mysterious connection between the Platonic world of mathematical concepts and the conscious minds that are necessary to perceive them.¹ This mental world is to be regarded as distinct from the world of physical objects, as represented in Figure 1. Indeed, I am making a clear distinction between minds and the physical brains which seem to be necessary - at least as far as common experience goes - in order that mentality can become manifest. The existence of this distinction between conscious minds and physical brains is an obvious one to those brought up in Indic traditions, although it is, perhaps, often overlooked by those whose culture is based on Western scientific ideals. Yet, as one who comes myself from such a scientific culture. I remain unpersuaded of any evidence for mentality beyond that which is familiar to us, occurring in conjunction with living, wakeful, healthy, animal brains (not necessarily human ones, as I believe that there is good evidence of conscious mentality in many animals other than ourselves). I am not, in principle, against the possibility of conscious mentality arising in other ways, however, and I am open to any indications which might point in such a direction.

All this notwithstanding, I would argue for conscious mentality to be not *independent* of physical reality. In Figure 1, I have drawn the third of our mysterious connections, namely, that which expresses the fact that when matter is organised in an appropriate way – and here I refer to that organisation that is present in our wakeful and healthy brains – then conscious mentality seems to come about. Thus, Figure 1 attempts to represent not only these three worlds, the physical, the Platonic mathematical, and the mental, but also the three profound mysteries which underlie the connections between these three worlds.

It may be noted that, in Figure 1, I have stressed the fact that although I am taking each world to lie within the compass of the preceding one, where we regard the worlds cyclically in an anticlockwise direction, it is only a small part of this preceding world which seems to be involved in the relationship. Thus, whereas the behaviour of the physical world seems to be governed by precise mathematical laws, there are many areas of mathematics that appear to have no relation to physical behaviour. (A glance at the papers in virtually any pure-mathematical journal will illustrate the point. Almost none of the material that is described has any significant connection – at least no expressed connection – with laws governing the behaviour

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of the universe). Likewise, passing to the second of our mysteries, it is clear that although our mentality has access to the Platonic world of mathematics, the vast majority of our mental activities are concerned with quite other matters. Finally, although the physical matter of our brains is so organised as to be capable of evoking conscious mentality, the vast majority of physical material – e.g., ordinary rocks – seems to be incapable of supporting consciousness.

I should remark, however, that in drawing Figure 1 as I have done, I have expressed certain prejudices of my own that need not be shared by others. For, in depicting the connection between the Platonic mathematical world and the physical worlds as encompassing the latter in its *entirety*, I am implicitly assuming that *all* physical behaviour is governed by mathematical laws. This is an assumption which could turn out to be false. It implies, in particular, that human actions are ultimately governed in this way, which seems (at first sight) to leave no scope for free will. It is my personal viewpoint that there need be no real conflict here, if the relevant mathematical laws turn out to have a sufficiently subtle and sophisticated form. We shall be coming to an issue of this nature in section 2, but I certainly make no claim to understand fully what could be involved here.

Passing to the other two mysteries, we see that my prejudices also demand that there are no mathematical truths that lie *in principle* outside the potential scope of human understanding. Again, this could well be false, although I do not believe that there is evidence against this prejudice from our understanding of the foundations of mathematics. I shall return to this issue, also, in section 2. Finally, Figure 1 incorporates my prejudice, as highlighted above, that there is no conscious mentality other than that which is rooted in physical structures of the appropriate kind. This prejudice, like the others that I have just referred to, also might be false.

In accordance with these further possibilities, Figure 1 would have to be redrawn, and in Figure 2 I have indicated how the diagram would appear, if all three of these prejudices of mine are violated. It is my view that none of these mysteries is lessened, if we broaden our perspective to allow for these possibilities, and in the discussions which follow, I shall make the simplifying assumption that these three prejudices of mine hold true. But the following discussion will have relevance even if we deny this assumption and adopt the broader perspective of Figure 2.



Figure 2: A re-drawing of Figure 1 in which violations of some of the author's prejudices are allowed for.

2. Computation and understanding

Let us now turn to a separate but related question, namely, that of the possibility that a *computer*, in the sense that we use that term today, could ever evoke conscious mentality, merely by virtue of its performing appropriate computations. It is a not uncommon viewpoint, particularly in some Western scientific circles, that whatever it is that enables consciousness to arise, as a result of the activities of our brains, must be a consequence of some form of computational activity. Such a viewpoint is sometimes referred to as *computational functionalism* or *strong artificial intelligence* (strong AI). I have written at length elsewhere (see Penrose 1989, 1994, 1996, 1997) to argue strongly against this viewpoint. A key ingredient of this argument is Gödel's incompleteness theorem, which can be paraphrased in the following terms:

Given any (sufficiently extensive) system \mathbf{R} of computational rules of mathematical proof, which one is prepared to trust as enabling one to derive only mathematical truths and no falsehoods, then one can construct a specific number-theoretic proposition $G(\mathbf{R})$ which one must also accept as true, yet not derivable by actual use of the rules \mathbf{R} .

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Thus, Gödel tells us that, whatever rigorous computational procedures we may lay down as acceptable methods of accessing mathematical proof, these will always fall short of what our understanding is able to achieve. More precisely, once we have formalised some of our mathematical understanding in the form of a set of computational procedures \mathbf{R} , Gödel shows us how we can *transcend* \mathbf{R} to obtain further rules that are not contained within the direct scope of \mathbf{R} itself. In detail, it is the same collection of insights that enabled us to trust \mathbf{R} in the first place, which also allows us to perceive truths that lie outside the scope of \mathbf{R} .

There is, indeed, something mysterious about this – and it is one reason that I refer to the connection between the world of conscious mentality and the Platonic mathematical world (as illustrated in figure 1) as a "mystery". This mystery has to do with the very nature of the concept of "understanding", here in the specific context of mathematical understanding. Although, I do not believe that we yet have any real scientific comprehension of what "understanding" actually is, we can at least perceive that it is something that is dependent upon the phenomenon of consciousness. It makes no sense, it seems to me, to say of some entity that it possesses an "understanding" of something if it is not even "aware" of that thing. This does not, in itself, get us very far towards a scientific appreciation of either "understanding" or "consciousness", but at least it tells us that the former seems to be dependent on the latter.

Moreover, Gödel's theorem appears to be telling us that whatever kind of a quality "understanding" might be, it is not something which is of an entirely computational nature.² In other words, a computer, no matter how powerful it might be, will not posses this quality. In fact, this is very much in accordance with the way that computers are used in modern science and society. The understanding is supplied by the human operator or programmer, and this understanding is necessary in order to provide the "meaning" and "interpretation" of whatever computation that the computer is undertaking. Even chess computers, which can now play the game extraordinarily well, seem to possess no understanding whatever of what they are doing. Believers of the strong-AI standpoint would argue that this is merely a temporary situation, and that when computers get more powerful and are programmed in an appropriate way, then the quality of "understanding" will begin to emerge. But as the preceding arguments indicate, my own position is not only to regard this as unjustified optimism, but to claim that actual understanding will never emerge simply from computation, and that something else must be involved -a "something else" that is also responsible for consciousness itself.

A few words are necessary, here, about the limited scope of computation within the realm of mathematics. It is probably a common misconception amongst non-mathematicians that mathematics itself is essentially a matter of computations of various kinds. However, I must stress that this is very far from the case. Although, computation is certainly an important part of mathematics, the vast majority of mathematical problems, it is fair to say, are non-computational in a precise mathematical sense. In the 1930s, a number of mathematical logicians - and most particularly Alan Turing (1937) - were able to formalise the ideal notion of what is meant by a "computation". Turing's description was in terms of what is now known as a "Turing machine" which is, in effect, a mathematical idealisation of a modern general-purpose computer, the idealisation being such that it has an unlimited storage capacity, never makes mistakes, and can run indefinitely without loss of effectiveness. Turing and others, showed that there are classes of mathematical problem which cannot be systematically solved by computation and, in a sense, the majority of families of mathematical problems are of this nature.

One example of a computationally unsolvable problem, (as was effectively demonstrated by Robert Berger 1966), is the general problem of deciding whether a finite set of tile shapes (say of "polyominoes" - made from equal squares in a plane, glued together along certain of their edges), will or will not tile the plane without gaps or overlaps. Thus, there is no computer program which can systematically answer this question for all such sets. Using such an unsolvable mathematical problem, it is possible to construct a toy model of a "universe" whose evolution is entirely deterministic, yet for which there is no computer simulation whatever (see Penrose 1997, pp. 118-122). According to the arguments given earlier in this section, it would follow from the assumption that, when conscious understanding is present, our brains must act precisely according to some mathematical laws, that these laws must be non-computational in character, whether or not they are deterministic. This conclusion is a consequence of the Gödel-type arguments that I referred to.

I have tried to illustrate this in Figure 3, where the black mark is to indicate the part of the Platonic-mathematical world which is computational in nature. The claim that I make from my arguments is

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that the scope of this computational mathematics within the actions of the physical world does not include that part which is responsible for mathematical understanding. And, if mathematical understanding is not explainable in terms of computational mathematical physics, then it is hardly likely that any other kind of understanding can be either. Still less may we expect a computational origin for other features of consciousness, such as the perception of pain, or of a musical tone, or of the colour green. Yet, our present view of mathematical physics is that the behaviour of the physical world is essentially something that could, in principle (if not in practice), be simulated on a computer. Non-computability is not part of our present-day physical world-view.

This notwithstanding, I would still hold to the viewpoint that it is the Platonic realm that is somehow guiding the behaviour of all physical actions. For this to be possible, there must be something fundamentally missing from our present-day physical world-view. In fact, there are, in my opinion, good reasons for believing this in any case. Our present procedures fall uncomfortably into three different regimes. When we consider the motion of large bodies, such as cricket



Figure 3: Only a small part of mathematics can be treated in terms of entirely computational processes. The author's ideas as to the scope of computational mathematics within the laws governing the physical world are illustrated.

balls or planets, we use classical (deterministic, computable) physics, such as the equations of Newton, Maxwell, or Einstein. When we consider small bodies, such as molecules, atoms, or fundamental particles, we use the (deterministic, computable) dynamical equations of quantum theory: essentially the Schrödinger equation. To straddle these two levels of description, we require a third (probabilistic, but otherwise computable) procedure, referred to as the "measurement process", or "the reduction of the state-vector". Modern physics consists of a hybrid, in which all three procedures need to be invoked, as judgement demands, despite the fact that they are, technically speaking, mutually inconsistent with one another. Although the resolution of this (seeming?) paradox is a highly controversial matter, it is my own firm opinion that all three procedures must be (albeit excellent) approximations to some as yet unknown physical theory. Moreover, the preceding comments would lead us to believe that it must be within this missing theory that the required non-computability resides. For further information, see Penrose (2000), Marshall et al. (2002), Hameroff and Penrose (1996).

3. Platonic ideals of the "beautiful" and the "good"

In the preceding sections, I have been taking the Platonic world of ideal concepts only in its capacity of representing mathematical truth. Mathematical truth is "truth" in its purest form, namely *necessary* truth. There is also *contingent* truth, which is dependent upon the details of the actual universe, as opposed to those necessary truths which must hold in *any* universe. Still, these notions are concerned only with the Platonic ideal of truth alone, whereas there are the other classes of Platonic ideal, namely *beauty* and *morality*.

Here, the issues are complicated by the fact that subjective elements undoubtedly enter. Particularly, in the case of beauty, it is clear that aesthetic judgements can differ greatly from person to person, yet, I believe that a good case can be made that there is, nevertheless, an absolute "Platonic" component to beauty, which is independent of the tastes of those who perceive it. In the case of music, for example, tastes can vary greatly, partly because of cultural background and partly as just a matter of individual differences. Yet, I believe that great music can only be great because of something that stretches far beyond such issues, transcending cultural and individual differences. In the case of morality, I believe that the case can be made more strongly for an absolute (Platonic) component, far transcending those particular

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conventions of culture and society that may lead us to accept various seemingly arbitrary distinctions between "good" and "evil".

There is a point of clarification that should be made at this point. To take the stand that there *is*, indeed, some absolute criterion of morality is very different from making dogmatic assertions as to *what* these criteria must be. I believe that *tolerance* is a vital part of morality. To assert that there *is* some irreducible truth about what is right and what is wrong – and that this implied morality is something to strive for – is a very different thing from asserting that one *knows* this truth, thereby condemning any deviations from one's particular views as to what constitutes "moral behaviour". Perhaps, a time may come when the absolute elements of morality will be revealed to us more clearly than they are today. But, for the moment, we must do our best to understand and to act accordingly, and to be sensitive to particular factors that may be unfamiliar.

Can one say anything "scientific" about the Platonic elements within beauty and morality, or must these issues remain outside the compass of science? To my own way of thinking, "science" just means "clear logical reasoning, objective observation and experimentation, rigorous mathematical argument, judgement, and solid good sense" - or things of this general nature. There is nothing that bars the methods of science from being applied to issues of aesthetics or morality. Nevertheless, it is true that present-day science has little or nothing to say about these issues. With the state of scientific knowledge as it stands at present, this is as it should be. To move outside the present restrictions on science - that it is concerned with revealing the truth about Nature and not with the beauty or ugliness of Nature, nor with its morality - would be to change what we presently mean by "science". But, to some extent, this is just a matter of terminology, and I do not have strong feelings as to how the word "science" is to be used, if we find that scientific method can be usefully applied in the broader areas of aesthetics and morality also. Caution is to be recommended, however, as, no doubt, there could be many unwarranted claims to a "scientific proof" of one or another aesthetic or moral concern.

Perhaps, there is one point of personal opinion that I might voice at this juncture. It is often said that science, as we know it today, is indeed concerned merely with truth, and it is of no concern to the scientist whether some discovery (e.g., nuclear energy) can be put to work for good or for evil. I do *not* completely agree with this position.

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For the scientist who makes such a discovery will be in a better position (at least temporarily) than his/her contemporaries to try to judge any social implications of that discovery. Thus, there is a duty for the scientist to address this question, and not simply to regard scientific discovery as something that can be treated completely divorced from its possible social implications. Having said this, however, I am well aware that (even famous) scientists responsible for important discoveries may completely misjudge their likely social implications. Yet, I believe that it is the duty of the scientist at least to try!

Finally, I wish to make some points that seem to show that the Platonic issues of beauty and morality are deeply interconnected with the Platonic issue of truth that I had been concerned with in the first two sections. In the first place, it is an undoubted fact that aesthetic judgements play a vital role in scientific discovery. This is particularly clear in pure mathematics, where the whole subject is essentially driven by the search for beautiful theorems and elegant demonstrations, the issue of applications being secondary. Not only do such aesthetic criteria provide the main reason for doing mathematics for its own sake (where the issue of applications may be regarded as secondary), but they also provide powerful ingredients in the search for mathematical truth. For some reason, which is to a large extent mysterious, there is a much better chance of finding results that are deep and true when a sensitivity to mathematical beauty is allowed to play its central guiding role. (See Hardy 1945.) It is clear, also, that aesthetic criteria can play a key part in finding laws that, at a fundamental level, closely govern the behaviour of physical things. The great physicist, Paul Dirac, made no secret of his reliance on aesthetic criteria in his search for the equations of physics, most particularly in his finding of the equation for the electron which bears his name. Perhaps, the most eloquent accounts of the role of beauty in scientific discovery are to be found in the later writings of the great Indian theoretical astrophysicist, Subramanyan Chandrasekhar (1987, 1992). See also Weinberg (1992) for a leading particle physicist's view on this issue. In Penrose (2003), I too attempt to address this issue (and see Penrose 1974).

In Figure 4, I have tried to illustrate the guiding influence that aesthetics has, in helping us, to uncover the mathematics that seems to underlie the behaviour of physical things. It plays an important role as a guide because, for some reason, the mathematics of the universe *is* just beautiful. I believe that this connection reflects something deep about the order in the universe, rather than it reflecting merely a feeling of

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satisfaction that a theoretical physicist might feel in finding some equation that reflects reality more accurately than that which had gone before. The implied inter-relation between the Platonic ideals of beauty and truth are intended to be suggested by the way in which I have drawn Figure 4.

What about the Platonic ideal of morality? How does this relate to the issues that I have attempted to address in sections 1 and 2 of this article? It seems to me to be clear that the issue of morality is intimately bound up with the issue of consciousness – i.e., with the mental world of Figure 1. I would say, even, morality would lose all meaning were it not for consciousness. For example, there is every difference in the world, from a moral perspective, between maltreating a slave and being brutal with one's computer! The slave suffers because he or she is conscious, whereas the computer feels nothing. On the



Figure 4: The Platonic Ideals of beauty and morality are brought into the picture of Figure 1, with some suggested connections indicated.

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other hand, if I am wrong, and the proponents of strong AI are right, and the computer can actually be programmed to be conscious, then there we do have a moral responsibility towards it. This would have relevance to those who try to design robots to explore distant planets. If such robots could be programmed actually to possess a genuine understanding of the environment of some remote planet, then (according to the arguments of section 2) they would have to be conscious. We would then have the moral responsibility to treat them well and to return them to a congenial environment (presumably on Earth) after they had completed their tasks. Such a moral requirement might well involve prohibitive additional expenses!

I provide this example largely to show one important reason to have a scientific theory of consciousness, if science - or some extended discipline going beyond what we mean by science today - is to be able to say something deep and non-obvious about morality. An issue of considerably more immediate relevance is that of animal consciousness. I have already stated, in section 1, that I believe that at least some non-human animals are conscious. They would consequently have moral rights, in my opinion. At our present stage of scientific understanding of consciousness, we can do little more than guess at these issues. But, if eventually some significant relevant scientific progress is made, then the scope (and the burden) of science or of what comes beyond science - will be enormously extended.

End Notes

- 1. I first used a diagram like Figure 1 in Penrose*(1994). The versions of Figures 1, 2, and 4 that appear here are modelled on figures taken from my forthcoming book Penrose (2003).
- 2. There is still much controversy about what can be rigorously inferred from Gödel's theorem about the nature of human mentality, and I have given only the basic line of argument here. For further discussion, see Penrose (1996) and the nine commentaries given in *Psyche* 2(1)1-88, with which this essay was concerned.

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Knowing and being: Exploring the cross-cultural contours of consciousness studies

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Introduction

Consciousness is a term with multiple meanings. Even in scholarly discussions, it has strikingly different connotations. A widely used and much abused concept, we find consciousness in one tradition much adored and worshipsed as an indispensable central feature of our being. In another, it is abhorred and dubbed as "treacherous" (Titchner 1915), indefinable (Dewey 1893/1886), vacuous "unintelligible" and (Sutherland 1989). Therefore, it is not surprising that consciousness studies have had a checkered history with their own golden and dark ages. Psychological science began in the West as a discipline of consciousness, but 'consciousness' soon lost its sheen, and was denigrated, because of the sheer inadequacy of introspection as a method of objective observation. At the height of the ascendance of behaviourism as the dominant player in psychology, "consciousness" was about to be discarded all together and banished from psychological discourse and academic psychology, because it smacked of subjectivity. With the advent of cognitive psychology, however, the taboos that tarred 'consciousness' have disappeared to some extent and the concept re-emerged with a modicum of respectability. Yet, lacking in conceptual clarity, the concept itself remains "clouded" as it were.

The ups and downs of interest in consciousness studies notwithstanding, the importance of consciousness in our lives is difficult to exaggerate. We can hardly speak of human nature without bringing in consciousness in some form, because it is as ubiquitous in the human condition as light and sound are in nature. In an important sense, consciousness is the defining characteristic of human beings. It is more complex and confusing than any other phenomenon in nature, because it is involved in a variety of activities in a very complex

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manner. For example, humans partake in spiritual quest as much as they do in scientific inquiry. We exercise logic and reason in our endeavours and yet we imbibe values bequeathed to us by tradition and not distilled by logical testing and rational scrutiny. Think of the biologist teaching evolution in the classroom and worshipping in church the "creator", and the divinity school and the medical college built on completely different and conflicting assumptions coexisting on the same university campus. Similar conditions, which I call "splitsoul" phenomena, are pervasive in our being and behaviour. These are not things to complain about. They are facts of life that need to be dealt with as such. At the practical level, we are not bothered by these two aspects of our nature. Only when we move on to a theoretical level, do we experience the dissonance and the intellectual need to reconcile the two.

Consciousness, as I see it, has two fundamental aspects, being (sat) and knowing (cit). The mind is the knowing instrument, the epistemological side, the awareness aspect of consciousness. The being side manifests in the reflexive reference of awareness to a selfengendering subjectivity and self-consciousness. Feeling comes somewhere in the middle. It is arguable whether it is also a fundamental aspect of consciousness or an adjunct of being. The western and eastern perspectives of consciousness parallel the scientific and spiritual traditions. The western approach focuses on the knowing aspect of consciousness. Consciousness becomes mind or a state of mind. In the eastern approach, the emphasis is on the being aspect, and consciousness is sharply distinguished from mind. In some respects, the eastern and western traditions appear to be as irreconcilably different as science and spirituality. I would like to argue that it is not necessarily so and that they can be seen as complementary rather than conflicting, if we understand consciousness in its two aspects of knowing and being.

When one experiences an intellectual dissonance aroused by the perception of the apparent contradictory stances in thoughts and actions, the resolution generally goes in the direction of according primacy and salience to one point and downgrading/rejecting the other. In this regard eastern and western traditions have taken different stances. Happily, this Conference and the others in the series, by taking both the aspects as primary concerns and by raising questions about science and beyond, take a more healthy route. I believe what is fundamental here is that we accord primacy to both aspects, which may

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be loosely labelled as science and spirituality (the beyond) inasmuch as we recognise that both manifest in our being and behaviour and coexist without any coercion. Only when we bring reason and logic to bear on them, do they seem to us irreconcilably different. This is not surprising because reason and logic are the tools of science and not of spirituality. Consciousness, which is involved in both scientific inquiry as well as spiritual quest, appears different when seen from the two different perspectives. Yet the underlying unity, the common ground covered, may provide the basis for reconciling the two seemingly opposing stances.

Science, with its concern for knowing the world rightly, emphasizes third-person objectivity. It looks at those aspects of consciousness that suit and are amenable to objective inquiry. However, spiritual traditions are concerned with being and seek personal growth and transformation. Therefore, first-person experience and subjective meaning are important from a spiritual perspective. What is interesting, however, is the fact that human beings, the seats of consciousness, manifest both aspects in a unified and nonconfrontational manner. Knowing and being blend harmoniously in human quest for identity and understanding. Only when they are separated conceptually and methodologically distinguished in our inquiry, do we have the problems of the kind that lead to insurmountable difficulties in reconciling the two aspects. As mentioned, consciousness characterises both science and spiritual quest. Therefore, considered conceptually and methodologically in its multifaceted and holistic best, understanding consciousness could be the way to close the seemingly unbridgeable gulf between the two. The eastern and western traditions took two different directions, emphasizing one aspect and neglecting or rejecting the other. In truth, they are two sides of the same coin; both are legitimate and bonafide. Problems arise where science attempts to address spiritual issues and when spiritual quest trespasses into science.

Consciousness studies: Western scientific tradition

Human Beings as conscious subjects function at two levels. Their awareness is directed, on the one hand, towards objects and events, fellow beings, their looks and actions. On the other hand, awareness is sometimes focused inward to one's own thoughts, feelings, beliefs and being. The way we attend to "outer" things is markedly different from

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the way we look at ourselves "inward". Even though the outer observations always involve subjective aspects, we often tend to ignore the latter, assuming that outer observations are truly independent of subjective factors. This characterises to a great extent the scientific perspective of consciousness in the West at least from the time of John Locke and Rene Descartes. Discussions of consciousness since then are dominated by four assumptions. First is the dichotomy of the mind and the body, which is either asserted or denied. Second, consciousness and mind are not distinguished. Third is the emphasis on intentionality as the defining characteristic of the mind. And, fourth, we find a conspicuous neglect of practical aspects and almost exclusive concern with theoretical understanding of consciousness.

When we speak of western or eastern traditions here, we refer to the dominant trends that characterise them in their quest for understanding who we are. It is not implied, however, that the western tradition is monolithic and uniform throughout its history. Rather we subscribe to the notion that there are shared assumptions that are the foundation blocks on which the edifice of western intellectual and scientific tradition appears to rest. These assumptions determine the perception of what is possible and what is not, what is right and what is wrong and so on. The same may be said about the eastern tradition as well. It is also not monolithic. Again, there are shared assumptions implicit in the *dominant* intellectual traditions of classical India. It is important that we emphasise here "dominant", because there are such systems as Carvaka that hold non-traditional views, but they are only peripheral and not part of the main stream. We should also point out at the outset that the stated differences between western and eastern perspectives are more a matter of emphasis than of exclusion. For example, the dominant trends that characterise western and eastern perspectives differ markedly on the emphasis they place on the subjective and the objective, i.e., the view from within and the view from outside. They do not exclude one in favour of the other. Rather they attempt to account for one in terms of the other, make different assumptions regarding the relation between the subjective and the objective and choose different methods for investigating them. The emphasis appears to be a function of the goals set and the concerns envisaged. The goals and concerns in turn determine the subject matter of study and the methods of inquiry.

I propose to argue that the goal of human endeavour in Indian tradition is the *transformation* of the person, whereas in the western

tradition it is understanding nature, which, of course, includes the person. The Indian concern is with the being and the West's is with knowing. The focus on nature led to an emphasis on the "outer" and the objective in the West, which in turn gave rise to the scientific tradition and all the technological marvels that followed. The Indian focus on the person led to an emphasis on the "inner" and the subjective, which suited the spiritual tradition of personal transformation. Quantitative methods and third-person observations became the bedrock of western science. Inner explorations and first-person inquiry became the basis of Indian tradition and the ensuing spiritual quest. Concepts acquired their connotations consistent with each tradition's concerns, aspirations and goals. Again the methods of inquiry and study had to match the subject matter of primary concern. It is interesting to note that, in this context, the Indian tradition led to an emphasis on the practical side, as far as the person is concerned, whereas in the West it stopped with attempts to understand the mind with hardly any significant endeavour to develop suitable "mental-technologies" for the transformation of the person. In the area of human science, then, the Indian approach tended to be teleological with the goal of transcending the existential condition to achieve "enlightenment", transpersonal experience and "spiritual awakening". The Western approach tended to be non-teleological. The focus was on the "ego" with social adjustment as the goal.

Mind and body: The mind-body dichotomy is possibly the most important, persistent and the least tractable of all the problems in the history of western philosophy (MacGregor 1989). Whether the duality of mind and body is asserted or denied, the problem tends to take centre-stage. Beginning with Plato, who sharply distinguished between mind (spirit) and body, dualism was the favoured view of most philosophers until recently. A radical and forceful enunciation of dualism by Descartes has had such a pervasive influence that the mindbody dualism has come to be the commonsense world-view in the western tradition. The main problem with dualism is the difficulty in relating mind and body to account for their interaction. This has led to the elimination of one in favour of the other as in idealism or materialism. These attempts, however, had only limited success. An outright reduction of one to the other appears to leave out something very basic in nature or in one's experience. Neither the argument that the sensible qualities may be reduced to neural excitations in the brain nor the reasoning that physical objects are no more than collections of sensible qualities appears feasible. The latter has little currency in

contemporary thought. The former is increasingly under pressure to account for subjective experience. Therefore, the more recent attempts to reformulate materialism seem to bring in qualia and subjective experience through the backdoor. Whether it is logical behaviourism or the identity thesis of materialism, mental attributes are ascribed to certain physical objects, even though the attributes themselves are taken to be physical. Dualism in some form, whether of entities or of properties, persists even when a philosophy professes to reject such dualism.

An important consequence of the persistent dualist debate is the ubiquitous subject-object distinction in the western discourse, which takes on several forms. Just as the mind-body dichotomy has given rise to the perennial problem of their interaction, the subject-object dichotomy has led to the problem of their relationship at different levels. Conceptually, does the subject contain the object or vice versa? Methodologically, do we understand the subject better by studying the object or, conversely, is the study of the object facilitated by inquiring into the nature of the subject? Substantively, it is the question of primacy of one over the other: what is the role of the subjective and the objective in our being? In philosophical inquiry, the problem has taken the form of attention to and emphasis on the "inwardness" or "outwardness" of being. In his comparative study of eastern and western philosophical traditions, Raju (1992) focused on this distinction. He wrote, "the general tendency of western philosophy is to disentangle outwardness from inwardness, ignoring or even rejecting inwardness, at least for philosophical purposes" (p. 86). Even Descartes, who found certainty in the "I", conferred that certainty on the ability to doubt and think. The essence of the "I", the mind, is thought. In other words, the existence of mind is predicated on thought and not the other way. It is not that we think because we have a mind, we have a mind because we think. Again, for Locke the mind is a tabula rasa. It is the objects outside of the mind that imprint the mind, and we have impressions. The situation is not very different in the phenomenological and existential traditions, which profess fundamental opposition to the positivistic obsession with naturalism. Βv emphasising that intentionality is the defining characteristic of consciousness, the phenomenological tradition asserts the primacy of the object without which there can be no awareness. This approach reaches its logical end in Sartre's characterisation of consciousness as "nothingness."

Consciousness and mind: Many writers in the West use "mind" and "consciousness" interchangeably to convey the same meaning. It was Descartes who explicity promoted this trend by asserting that the mind is the thinking thing (res cogitans). This tradition has since continued to characterise the western mindset. For example, since the decline of behaviourism, the eclipse of positivism, and the respectable reemergence of consciousness in psychological and philosophical discourse, a large number of books has appeared on the subject. The almost equally divided between titles of these books are "consciousness" and "mind". Consider some of the recent titles: The Nature of Consciousness (Block, Flanagan and Guzeldere 1997), Conscious Experience (Metzinger 1995), The Science of Consciousness (Velmans 1996), The Embodied Mind (Varela, Thompson and Rosch 1992), Consciousness and Experience (Lycan 1996), Consciousness Explained (Dennett 1991), The Rediscovery of the Mind (Searle 1992). Shadows of the Mind (Penrose 1994), and The Conscious Mind (Chalmers 1996a). Interestingly, Flanagan's book in 1991 is titled The Science of the Mind. His 1992 book has the title Consciousness Reconsidered. Both books cover the same ground. Again, some authors use both mind and consciousness in the same title. For example, Dennett's 1996 book has the title Kinds of Minds: Towards an Understanding of Consciousness. Alwyn Scott titled his 1995 publication Stairway to the Mind: The Controversial New Science of Consciousness.

True to the Cartesian legacy, Titchner (1909) stated explicitly: "Consciousness is identified with mind and 'conscious' with 'mental' " (p. 18). Even those who rejected consciousness as a usable concept in a scientific discourse, regarded it as another word for "mind". More recently, Searle (1992) pointed out: "The study of the mind is the study of consciousness, in much the same sense that biology is the study of life" (p. 227).

When Descartes and Locke wrote about the mind as consciousness, there was little appreciation of non-conscious mentation and the unconscious. But now, implicit awareness is widely seen as an aspect of the mind. So, we find in a textbook on the psychology of consciousness (Farthing 1992): "Consciousness is not the same as mind. Mind is the broader concept, it includes both conscious and unconscious mental processes" (p. 5). Interestingly, this book which discusses in just as much detail the unconscious mental processes as it

does conscious states is titled *The Psychology of Consciousness* and not the psychology of the mind, once again conforming to the western mindset of treating consciousness and mind as identical and interchangeable concepts. If consciousness is the proper subject matter of the book, the non-conscious processes should recede into the background. Alternatively, if the book deals with both conscious and non-conscious mentation, the appropriate title would be "the psychology of the mind."

Farthing is, however, not alone in suggesting that we restrict the meaning of the concept "consciousness" to subjective or introspective awareness. In fact, such a restriction is not uncommon in psychological discussions of consciousness and mind. However, we find striking inconsistencies in the use of the concept even among those who presume a distinction between mind and consciousness, as we have pointed out in the case of Farthing. The reason for this possibly rests in the fact that subjectivity is only a qualitative aspect of consciousness, which manifests in various degrees and in a variety of forms. Awareness in dreams, hypnogogic imagery and other forms of conscious experience in altered states suggest that focal awareness is not the fundamental and ineliminable mark of consciousness and that such a characterisation does not capture the totality of its connotation. As mentioned, the problem did not exist for Descartes and Locke who did not consider the possibility of non-conscious mind or mentation without subjective awareness.

Intentionality: Another feature of the western conception of consciousness is that intentionality is its defining characteristic. Consciousness is of or about something. We are aware of this or aware that such and such is the case. Descartes regarded mind essentially as subjective consciousness. The contents of consciousness, the ideas, represent to us the objects in the world. Consequently, mind is regarded essentially as intentional. This notion of intentionality, was further and more systematically developed by Brentano (1973). He wrote in his inimitable style that "intentional in existence is excessively peculiar to psychical phenomena". Brentano distinguishes between content and act in mental phenomena, and asserts that all mental acts have meaningful content.

That consciousness always points to something, i.e., mental phenomena have a *directedness* about them, is a notion that is endorsed by a diverse mix of philosophers and psychologists in the western

tradition. For example, Armstrong, a philosopher of materialistic persuasion, argues that all consciousness is consciousness of something (Armstrong and Malcolm 1984). Similarly, naturalist philosopher, Searle (1983), emphasizes that intentionality is the essence of mind/consciousness. Intentionality of consciousness is, of course, central to all phenomenology. Husserl attended Brentano's lectures and he fully subscribed to the latter's view that consciousness is essentially intentional. Freud and Sartre, among others, have emphasized the intentional nature of consciousness.

The intentional view of mind/consciousness entails in some form the representational theory of cognition and knowledge. Whether it is the "input-output" model of cognitive scientists or the more traditional notion that the mind is a mirror of nature, we are led to believe that there is a pre-given world of which our cognitions are representations. Inasmuch as every act of consciousness intends something and every thought has an object, we are inescapably led to the notion of subjectobject duality and the known-knower distinction. Even those who are vehemently opposed to such dichotomy on ontological grounds, have difficulty in circumventing the duality of the knower and the known. William James, for example, wrote: "The attributions subject and object, represented and representative, thing and thought, thus signify a practical distinction which is of the utmost importance but which is only of a *functional* order and is not of an ontological order as classical dualism presents it. In the final analysis, things and thoughts are not fundamentally heterogeneous. They are, instead, made of the same stuff, a stuff which cannot be defined as such, but can only be experienced and which can be called, if one so desires, the stuff of experience in general" (James 1912/1947, pp. 232-233). Thus, while rejecting dualism in its interactionist mode, James locates both mind and matter, the knower and the known in experience-as-such. But what that experience is, remains as elusive as the interaction of mind and matter in dualistic postulations. In fact, James is more explicit and concedes some kind of epistemic dualism in the Principles. "The psychologist's attitude toward cognition...", he writes, "is a thoroughgoing dualism. It supposes two elements, mind knowing and thing known, and treats them as irreducible" (James 1952, p. 142).

Again, the existential philosopher, Sartre, observed that consciousness by its very nature is consciousness of things other than itself. The objects of consciousness are characterised as being, the in-

itself. Consciousness, the for-itself, is dependent on the objects for its being. The being of conscious, according to Sartre, consists in its intentionality to posit a transcendental object. Thus, Sartre wished that the subject-object duality would "disappear from philosophical preoccupations" (Sartre 1957). But it remains completely mysterious how, by being intentional, consciousness transcends itself in relating the knower and the known, as Sartre believed. In distinguishing the conscious self (subject) from the world (object), Sartre creates for himself an inescapable dualism.

The emphasis on the intentionality of consciousness in western tradition thus highlights, on the one hand, the distinction between subject and object, whether functional or foundational, and entails, on the other hand, a disbelief in consciousness-as-such, consciousness devoid of content. If consciousness is inseparable from its phenomenal content, we can have no direct knowledge of the world except through its phenomenal representations. Even those who conceived of transcendental aspects of existence, such as Kant, had to admit that things in themselves are essentially unknowable. The paradox of such veiled existence is no better illustrated than in the philosophy of Husserl (1965).

Neglect of the practical aspects: The third feature of western discussions on consciousness is their almost total preoccupation with rational theory and abstraction, undermining the practicality, which is again so evident in Husserl (1965). It is, indeed, paradoxical that the western tradition, so steeped in the development of science and its application to the human condition in the realm of the physical world, is so overwhelmingly theoretical in the area of the mental. If there were any practical concerns with consciousness in the Western tradition, as in psychoanalysis and certain psychotherapies, they were always limited to dealing with "disturbed" individuals and for restoring them to a normal state, but not to raise them to higher levels of awareness. This was largely due to the fact that the goal of western psychotherapy is social adjustment and the preservation of the ego and not its transcendence. Husserl himself felt that his own European intellectual tradition stood in sharp contrast to the Indian. Chinese and other Eastern traditions that foster a mythical-religious attitude that set practical goals (Husserl 1965). It is, therefore, not surprising that western philosophies even when they emphasized experience, as in Husserl's phenomenology, remained essentially intellectual pursuits.

This aspect constitutes both the pride and the problem inherent in the western tradition. The pride is the remarkable progress in science; and the problem is the need for a philosophy of whole life. The western emphasis on rational thought led inevitably to an overwhelmingly scientific attitude. This began with the ancient Greek conception that the essence of man, the soul, is reason and culminated in positivism and physicalism and contemporary materialism. The predominance of reason and objectivity in science resulted in a chasm between science and religion, between belief and behaviour. We teach evolution during weekdays in classrooms and offer prayers to the Creator on Sundays.

The main thrust of the cognitive psychology of consciousness has been to study the non-conscious mind with the hope that somehow that would account for consciousness. This has not worked. This approach is flawed, conceptually and empirically. At the conceptual level, it is all too obvious that we need to make a basic distinction between mind and consciousness, whatever we may mean by them. At the empirical level, an equivocation of consciousness and mind has lead in the West to what appears to be a dead end with no fruitful avenues for exploring consciousness. Consciousness has thus become, in the western scientific tradition, either a vacuous concept or one that is simply beyond objective understanding and scientific study.

Contrary to the scientific world-view, the commonsense conception accords primacy to consciousness/mind, conceived as falling completely outside of naturalistic postulates. Yet, its presence is considered necessary for the phenomena of our experience. This Cartesian world-view of mind-body dualism continues to be the commonsense mindset in the West. However, dualism of the sort advocated by Descartes stands discredited as a viable theory by mainstream science as well as by the dominant philosophical traditions currently fashionable in the West. The reason for opposing Cartesian dualism is the problem of mind-body interaction, which has become too difficult to resolve. How do two entities so fundamentally different as the incorporeal mind and the physical body influence each other without violating the well-established law of conservation of energy?

Eastern approach: Spiritual tradition

The crucial and the most striking respect in which the Indian notion of consciousness differs from the western is the basic distinction made

between consciousness-as-such and the mind. This distinction is crucial in that it has several important psychological as well as epistemological and metaphysical implications. The distinction itself is a consequence of the over arching concern in the Indian tradition with *being* rather than *knowing*. The emphasis on "being" leads to the essential and inseparable evaluation of the existential matrix surrounding the being and an equally important concern for elevating the human condition to the best achievable state.

The existential predicament is seen as suffering and the goal is to escape from it to a state of transcendence, a state of bliss or ananda. The predicament is a consequence of the identification of the consciousness with the mind. The escape is through the control of the mind. Karma is what binds consciousness with the mind, and gives rise to the constellation of the ego and the concomitant attachment. Therefore, the purification of the mind by cleansing of its karmic deposits enables one to achieve the dissolution of the ego and the disappearance of the attachments that colour our awareness and bias our attitudes. The concern with the *being* aspect, the experience of the existential predicament and the motivation to escape from it to attain a state of bliss or *ananda* are the steps in the path of spiritual quest. They stand in sharp contrast to western scientific inquiry, which with its concern for knowing is content with analysis and understanding without paying any attention to the value dimension. Thus, spiritual quest is value-laden and scientific inquiry is aimed at being value-free. Inasmuch as knowing is an aspect of being, inquiry cannot be completely devoid of values. Spiritual quest is driven by values all the way. Scientific inquiry, which begins bereft of values, finds them after the fact and, therefore, has unpredictable consequences.

Mind, in the Indian tradition, is considered to be a subtle form of matter, whereas consciousness is completely non-corporeal. The mind is the interfacing instrumentality that is connected to the external world at one end and to consciousness at the other. Mental phenomena, therefore, manifest the influence of consciousness as subject and of the world of things as objects. The subject-object dichotomy that is implicit in our ordinary phenomenal awareness is a consequence of the stage the mind sets up for the play of consciousness and the material world as subject and object.

The attention to the "inward" in Indian thought has led to an emphasis on consciousness and its primacy. The primacy is asserted

either as an overarching single reality as in *Advaita* monism or as an irreducible aspect of reality independent of the physical as in *Samkhya-Yoga*. In either case, the assumption is not engendered by rational argument alone based on metaphysical presumptions. They are derived from their respective epistemological positions, which are themselves grounded in psychological assumptions based not merely on the authority of the *Vedas* but claimed to be empirically supported.

In its quest for truth, the Indian tradition turning inward attempts to identify the elements that tend to distort and falsify our general understanding of the world around us. It seeks to explore methods and strategies to control them. Further, it endeavours to develop techniques that reveal truth in its pristine and unsullied condition, to formulate philosophical theories and to prescribe practices of conduct consistent with the truth so revealed. In such a scheme, the first step is to understand how we normally acquire information and the possible limitations and imperfections of such information. The beginning point then is cognitive science as systematic epistemology.

Now, the predominant mode of acquiring information is sensory processing. Such processing is known to be biased because of the manner in which the processing person is situated, whose presuppositions, attitudes and motivations constrain and bias perceptions. More importantly, the processing mechanisms themselves determine to some degree the form, the extent and situation of the content of cognition. The way bats perceive the world is different from the way we do. Humans cannot process low auditory signals as dogs or deer can. If we were situated differently with different kinds of sensory-motor apparatus, we would likely function differently and our knowledge of the world would be different in significant ways. What then is the "true" world? Answers vary depending on what one's focus is. If the focus is outward, one's perception of the world consists in the way it is represented to us. Representations are believed to be true inasmuch as they are seen to correspond to external objects and events, a correspondence attested by inter-subject agreement/validation. Outward reality is known only via the representations we have of it and, in Kant's terms, the things-in-themselves are forever unknown. We take our perceptions and observations as revealing reality the way it is. Our knowledge of the world is true and valid to the extent we have consensual agreement on it. If the focus is inward, however, one tends to view true reality as no other than awareness itself, and not what it is

supposed to represent. Some philosophers in the West subscribe to the former view and assert that our perceptions constitute reality. In the Indian tradition, even when reality is equated with awareness, awareness is not limited to representational perception. Rather awareness is regarded as consisting of direct and unmediated awareness of reality. Such non-representational awareness in a significant sense is reality itself. Humans, it is assumed, have the ability to realise reality in itself as *consciousness-as-such*. Indeed, it is generally agreed among Indian thinkers, independent of their metaphysical preferences, that, by following specified procedures and cultivating certain habits of mind, it is possible to attain states of awareness different from perceptual awareness. It is further assumed that awareness-as-such is reality itself. Such an understanding underscores much of Hindu and Buddhist thought.

We, thus, find in the Indian tradition a belief in the possibility of non-sensory source of knowledge, which, by its very nature, is free from the distortions and imperfections that beset sensorially processed information. The ultimate goal of human achievement is spoken of as liberation or moksha. It is liberation from the dependence on imperfect sensory awareness. In an important sense, the bondage of the mind to its sensory apparatus is believed to be the most significant single source that screens true reality from us. For the one who realises reality in its true form, the sensory knowledge we have of the world appears as nothing but ignorance or avidya, as a dream appears on waking. Freedom from such ignorance and disinformation is a necessary condition for realising truth in one's being. The goal is to achieve perfect knowledge, and perfect knowledge makes one perfect. To know Brahman is to be Brahman. Knowing is thus the realisation in the being. The strength of such assertion is not derived merely from rational argument. Rather, it is grounded in the belief that it is possible to find such persons in real life. Realising consciousness-as-such is considered an empirical fact experienced subjectively as well as shared by those who undergo necessary training and practice (sadhana) the prescribed discipline. Yoga is considered almost universally by Indian thinkers to be a useful technique for emancipating the mind from its existential condition of sensory bondage, so that it can access consciousness-as-such for realisation of truth, absolute and unsullied.

The equating of mind and consciousness has another important consequence in the western tradition. In general, as mentioned, intentionality has become the defining characteristic of consciousness.

As we have observed, the emphasis on the intentionality of consciousness highlights, on the one hand, the fundamental distinction between subject and object, whether functional or foundational, and entails, on the other hand, a representational theory of knowledge. Moreover, it rules out *a priori* the possibility of pure conscious states. If consciousness is conceived to be inseparable from phenomenal content, there can be no direct knowledge of things except through their phenomenal representations. Even those who conceived of transcendental aspects of existence, such as Kant, admitted that things in themselves are essentially unknowable.

If consciousness, as awareness in its broader sense, includes explicit as well as implicit awareness, then no fundamental distinction between consciousness and the unconscious can be sustained. Similarly, attempts to restrict consciousness to focal attention, shortterm memory or reflective awareness, i.e., awareness accessible to introspection, and to regard the mind more broadly to include implicit awareness and unconscious processes (Farthing 1992) are unsatisfactory.

The question then is whether consciousness is merely a quality of mental representations, as implied in the notion that equates it with focal attention or other brain processes. Alternatively, do mental phenomena, as they manifest in our experience, involve an independent factor or process without which experience of awareness is not possible? The western approach favours the notion that consciousness is merely a quality of certain mental states. The eastern perspective, however, takes the alternative position that leads us to regard consciousness as an independent source that makes subjective awareness possible in the human condition. In other words, in the Indian view, cortical processes alone cannot give us subjective awareness. Here, a basic distinction is made between consciousness and mind, a distinction that helps to resolve the problem of interaction between mind and body in some important aspects. In Buddhism, however, consciousness is not seen as an outside source, something different from the mental states. At the same time, all schools of Buddhism recognise the existence of transcendental mental states and provide for non-intentional states of pure consciousness. In the Madhyamika and Yogacara schools, this point becomes more explicit in the concepts of sunya and alaya-vijnana.

In the Advaita system as well as in Samkhya-Yoga, consciousness is considered a fundamental principle that lies outside of physical things. It does not, however, interact with material objects, events and processes, but its presence makes them knowable. Consciousness is the light that shines on the objects of the universe and makes them subjectively realised. Since consciousness has no direct influence on physical things and does not interact with them, no physical laws are violated. The mind is conceptualized as the interfacing instrumentality that is connected to consciousness at one end and to the objects of cognition and action at the other. It processes information from objects and events accessible to it, making use of the brain and the sensory system. When consciousness shines on the processed information, there is sensory awareness of it. In this view, the relation between consciousness and the mind, at one level, is like the relation between the mirror and the image it reflects. The material forms processed in the mind lack subjectivity. They are mere images, which the mind may become aware of only in the presence of consciousness. The reflected images become the objects of sensory experience in the mind of the experiencing person. Subjective awareness thus involves (a) the presence of consciousness, (b) a functional mind capable of processing the sensory and proprioceptive inputs it receives and of experiencing their images in the medium of consciousness, and (c) the inputs themselves. All three are necessary conditions for phenomenal awareness to manifest.

In the Hindu systems, there is more to consciousness than being a mere light source for the apprehension of images and sensations processed in the mind. It is considered to be the ground condition without which no awareness is possible. It is the knowledge side of the universe. If the mind withdraws itself from participating in sensory processes, and empties itself of all sense data and associated effects, it would be in a position to access consciousness-as-such. When the mind is able to access consciousness-as-such, there arises unmediated and direct knowledge, which is what consciousness is in-itself. To the mind filled with sensory data, consciousness is a reflecting source. When the mind is emptied of sensory contents and partakes in pure consciousnesss, it experiences realisation of knowledge in a direct and unmediated way. Such an experience by its very nature is ineffable and beyond verbal descriptions, because it is non-representational. However, such an experience may have immediate behavioural and attitudinal consequences for the experiencing person. The person may be transformed in important ways. Also, acts of creativity, value

insights and intuitive apprehension of the working of the universe may manifest following the experience of a pure conscious state.

The above view may not be considered as contradicting the western tradition in its positive aspects or as questioning the remarkable contributions of western science to our understanding of a variety of mental functions. The role of the different constituents of the brain, their processes and functions, the cortical connections of mental phenomena, are duly acknowledged. Buddhist psychology, which discusses in some detail the mundane states of consciousness at the kamaloka and rupaloka planes, is a good example. While overcoming the limitations inherent in the western assumptions, the eastern view suggests possible ways of expanding them to include other forms of awareness that appear anomalous from the western perspective. Also by asserting that there is more to mental phenomena than what goes on in the brain, the eastern view takes us beyond the brain and the mind to consciousness-as-such. Thereby, it offers a reasonable explanation of subjective experience, which neuroscience and cognitive psychology find very difficult to fathom and which continues to be an intractable problem for naturalism in its philosophy of mind.

If consciousness is an autonomous principle irreducible to material forms, as is claimed in the eastern tradition, we may ask, how is it then different from the mind as postulated in western dualistic doctrines? In the Indian formulations, as we have noted, a distinction is made between consciousness and the mind. The mind is conceived as an interface between consciousness and the brain. Such an interface is considered possible because certain characteristics attributed to the mind are akin to consciousness, e.g., the *sattva* element in the *Samkhya* system. This suggests that there might be some value in looking for new forms of matter and material functioning to resolve traditional puzzles of the mind–body relation. It is interesting to note that, in recent years, a few scholars in the western scientific tradition, who are dissatisfied with all attempts to reductively explain consciousness in familiar physical terms, appear to be embarking on a similar course (Penrose 1994; Chalmers 1996b).

The Eastern conception of mind as the interface and gateway between consciousness and the objective world, I am persuaded, frees us from the compulsions of such disjunctive categorizations as subject/object, known and the unknown. Mind in the Indian tradition is

the tool of awareness; it is our reality connection. When it connects with the objective world through our sensory system, we have phenomenal awareness. When the connection is to consciousness, we have transcendental realisation. We make here an important distinction between states of awareness that give us representational knowledge on the one hand and those that bring about direct realisation of unmediated knowledge on the other. While experiencing awareness, it is possible to have dissociation between cognition and conduct. A state of realisation is one where there is no room for such dissociation. Knowing and being become inseparable. The lives of true saints and those who had genuine "peak" or self-actualizing experiences are cited as instances of realisation. Realisation, on the one hand, removes any dissociation between belief and behaviour. On the other hand, it has immediate transformational consequences. Accessing consciousness-as-such is achieving a state of realisation, which is believed to have a remarkable impact on one's life, conduct and values. Such a transformational possibility has important implications for our well-being, for mental health, therapy and educational practices.

Now, contrast this with the dualism of Descartes, where mind is consciousness and it is non-physical. How then do mind and the physical body interact? We all know how unsatisfactory are the attempts to answer this question. The essential feature of the mind, according to Descartes, is consciousness, and consciousness is thought. Indeed, it is self-evident that one cannot doubt that he is doubting; but can one doubt without the brain? If the brain is necessary for thought and awareness, how can thought be the essence of consciousness? Inasmuch as experience manifests at the phenomenal as well as transcendental levels, there is need for a concept like mind, distinct from consciousness-as-such, which can be the bridge between consciousness and material reality.

We should keep in perspective that the Eastern model is not presented as a mere intellectual abstraction or a philosophical postulate, but as an empirical claim. The entire gamut of psychic development disciplines in the East are based on that claim. Therefore, the question of whether consciousness-as-such really exists should not be settled on mere theoretical grounds, because pure consciousness is not a logical presupposition. Its existence is considered a fact of experience. There are numerous instances of claims in the East of those who are believed to have achieved states of pure consciousness. The practice of *yoga*, for

example, is considered to be an important technique for reaching higher states of awareness and for accessing consciousness qua consciousness.

The problem of interaction is then a non-issue from the eastern perspective, because mental phenomena are not conceived as resulting from an interaction of consciousness with the mind or the brain. Minds or brains do not interact with consciousness. The relation between consciousness and the mind is not causal, one influencing the other. Rather it is reflexive, projecting one on the other. In the Eastern tradition, consciousness is assumed to be an autonomous principle inexplicable in terms of brain states. It does not cause mental phenomena nor does it influence the physical states of the brain. The mind, however, influences and is influenced by the brain states and by its own actions. Thus, consciousness-as-such has no causal role, but mind participates in upward as well as downward causation. The distinction between consciousness and mind thus circumvents the problem of interaction between non-physical consciousness and physical body. They coexist, but do not interact. The interaction is between the mind and the body. Both are material forms. Mind, like the brain and unlike consciousness, is physical. Like consciousness and unlike the brain, it has non-local aspects. By partaking in the processes of the physical systems, including the brain, and by its facility to access consciousness-as-such, the mind is a source of two distinctive processes of awareness, the normal and the paranormal.

Normal and paranormal processes

The conceptual distinctions between 'consciousness', 'mind' and 'brain', and the notion that the mind is the interfacing instrumentality of consciousness and brain activity warrants the assumption that there may be two distinct processes of awareness, the normal and the paranormal. In normal awareness, such as perceptual awareness, we postulate (1) a subject who has awareness, (2) the object of awareness, and (3) the process of awareness. The object is related to the subject through the instrumentality of sensory mediation and the processes in the brain. The resultant awareness is thus constructed to represent the world to us. In this situation, the subject and the object are seen as divided and separate, but related by the mediation of the senses and the brain's functions. What we have in our perceptions of the world are the appearances of reality in the form of representations and not the reality itself. In that sense "things-in- themselves" remain forever "unknown".

Now, consider the possibility that a subject is in direct contact with and has unmediated access to the object. Awareness arising out of unmediated access would be an instance of what we refer to as paranormal awareness. Such awareness would indeed be different in kind from normal awareness. In normal perceptions, for example, the object is represented, and it is these representations and our reflections on them that give us "knowledge" of the object perceived. Since all of us have similar sensory systems and cortical structures that process the energy patterns emanating from the object in similar ways, we have shared representations that give us a sense of objectivity about them. Also, we make assumptions about reality, as it is represented to us, and we test these assumptions by means of other representations and thus attempt to verify and validate our assumptions about the objects of representations and the nature of reality. Our knowledge of reality is thus indirect, mediated and in a sense inferential. On the other hand, the awareness we would have, if we had unmediated access to the object would be direct and not represented via sensations, images and thoughts. Instead, such unmediated awareness would acquaint us directly with the object and we would have an awareness of the objectin-itself. This may be termed as "knowing by being".

Awareness via sensory representations is "knowing" by "sensing"; unmediated awareness is awareness by direct acquaintance or awareness by being. The former approximates what we generally label as information. The latter may be thought of as revelation or realisation as distinguished from understanding. Information is cognitively processed awareness, whereas realisation or revelation is awareness-as-such, an experience by being. In paranormal processes, then, there is no information flow; and it is contentless awareness in the sense that it is devoid of any sensory content. When consciousness-assuch is described as having no content or form, it is likely that the reference is to sensory content and form. When the relation between the mind and the object of awareness is one of *identity* rather than of *representation*, the resultant awareness is considered to be devoid of form and content.

In Indian thought, such as in *Samkhya-Yoga*, it is assumed that there is a primordial existential state, the ground condition, an amorphous and undifferentiated state in which knowing and being are indistinguishable. They are seen as coalescing into a single state. With the development of the sensory and the cortical systems, knowing and

being branch off and are differentiated. Awareness becomes a state of knowing instead of a state of being, and we tend to increasingly become dependent on cortically processed and sensory mediated awareness, and lose touch with awareness by being. Normal awareness is awareness of representations; paranormal awareness is awareness of reality-as-such. The latter involves reflexive identity between the subject and the object. The former involves the subject's reflection and the object's representation, and the subject–object relationship then is *causal*.

If paranormal awareness is thus conceived to be consciousness-assuch without sensory content, how is it different from a state where there is no awareness at all? Accustomed, as we are, to depend almost exclusively on mediated awareness, it is only natural to think that it is the only kind of awareness there is. Recall that our perceptions are only appearances, and their genuineness is tested by appeal to inter-subject consensus and other assumptions we make of reality. Awareness-as-such, on the other hand, does not require such cross-validation, because it is unmediated awareness of being, a relationship of identity and direct acquaintance as distinct from descriptive awareness by representation. Its validity is reflexive, unlike cognitive awareness, which is reflectively validated. Awareness-as-such, by assumption, does not involve any sensory processes, has no representational content, and yet it influences, as mentioned earlier, our lives in important ways. We may consider the lives of true saints and those who had genuine near-death and "peak" experiences that were life-transforming as examples of states of unmediated awareness or realisation.

Considered in this manner, the normal and the paranormal may indeed be complementary processes. We may speculate further that the validation of our perceptual appearances as reality may itself be grounded in the paranormal. Universal values may have their origin in intuitive awareness of truth, beauty and goodness. The basic principles underlying fundamental discoveries, the seeds of creativity and the inspiration for artistic excellence may have intuitive genesis. Their validation via scientific formulation or evaluation by art criticism, however, is a consequence of rational reflection. In fact, we may conceive that the basic values that govern our conduct in general and seem to pervade across cultures and persist over the ages are likely given to us intuitively. We may also adhere to the notion that there is nothing purely random in nature or in our behaviour. It is not unlikely

that all our behaviour and, indeed, the entire course of nature is determined by normal or paranormal processes or a combination of both. It is possible that apparent random behaviour, where we find no normal causation, may have a paranormal source. Take for example the case of evolution. There are no generally agreed upon probability formulae among mathematicians and biologists to satisfactorily explain how our biosphere has evolved the way it did by random mutation and selection. The inherent difficulties in the classical Darwinian position have led at least one eminent biologist, Sir Alister Hardy, to suggest that a paranormal system may interact with a normal physical system in the evolutionary process and thus account for some of the gaps left by classical selection theory and some of the strange "jumps" in evolution. Again, the distinction between explicate and implicate organisations made by David Bohm is similar to the one we have made between normal and paranormal processes.

Concluding summary

Understanding consciousness is clearly a very complicated and frustrating undertaking. First, in commonsense usage as well as in scholarly discourse, consciousness has acquired multiple connotations. Second, there are no generally acceptable criteria to identify consciousness in all its forms and aspects. Third, consciousness appears to be intrinsically subjective and impervious to third-person observation and objective measurement. Viewing consciousness in all its forms is more like looking at a mountain than non-hierarchical flat terrain. Consequently, consciousness may appear to have different characteristics as we view it from different angles, explore it at different levels and examine it from different perspectives. What may indeed seem to be appropriate criteria from one perspective may turn out to be inappropriate when looked at from another. The conceptual maps and the methodological tools needed to explore the terrain of consciousness may have to be different, as we move from one level to another.

If consciousness does, indeed, refer to a number of things, then it is arguable whether all the things, it connotes, constitute a conceptually coherent cluster. There appears, however, to be a fair amount of consensus among the students of consciousness studies that consciousness implies awareness. Awareness may be explicit or implicit. It may refer to a state of being or to an item of experience. As a state, awareness is subjective and appears to be essentially a first-

person item. As an item of experience, consciousness has third-person ramifications and is open for shared observation. Addressing these two aspects of consciousness, we may ask what is it like to be conscious and what consciousness is of or about. These are existential and intentional aspects of consciousness.

"What it is like" is the *being* aspect and "what it is about" is the *knowing* aspect of consciousness. Together they constitute the information/meaning side of the universe. Without consciousness no awareness is possible; and the question of knowledge simply does not arise. In processing information from an outside source, consciousness bestows subjectivity on items of awareness. Information becomes subjectively realised as knowing. Turned inward and focused on itself, consciousness reveals itself in one's being.

Knowing and being are thus the two sides of consciousness. In the West, the concern is overwhelmingly with knowing. In Indian thought, the focus has been on the being. Concern with the being aspect has led to the conception of pure consciousness or consciousness-as-such. The notion of consciousness-as-such implies its distinctiveness from the mind. Once we conceive consciousness as something independent of the mind and make a fundamental distinction between mind and consciousness, as is done in the Indian tradition, a number of other important consequences follows.

The postulation of pure conscious states suggests that (a) intentionality is the defining characteristic of mind and not of consciousness; (b) that knowledge is not always representational; and (c) that the distinction between subject and object is not fundamental or foundational to the process of knowing. It follows further that consciousness is not an adventitious quality of certain states of the mind. Rather, it is an intrinsic principle that governs the universe. The two aspects of consciousness, knowing and being, imply that awareness is of two sorts – awareness by sensing and awareness by being. Sensory awareness is mediated and representational. It admits of knower–known distinction. Awareness by being is direct, non-mediated and non-representational subjectivity. The dichotomy of subject–object is dispensed with. They are seen as reflexively related and not causally connected.

Sensory awareness gives one *understanding* of the object of awareness, whereas awareness by being results in *realisation* of awareness in one's being. Understanding is *objective* and admits of third-person observation. Realisation is *subjective*, but can be shared in terms of personal transformations resulting from subjectively realised phenomenon.

The Indian conceptions of consciousness and the mind leave open the possibility of achieving transpersonal states, paranormal abilities and post-mortem survival of some mental states. What is of particular relevance here is that the Indian notions are not armchair speculations or mere metaphysical assumptions. They have empirical ramifications and application to real-life situations. For example, Indian theories of consciousness have important implications to educational theory and practice. In asserting that knowing goes beyond understanding to include realisation of truth in one's being, education in traditional learning tends to be value-filled rather than value-added. The galloping pace of our understanding of the physical forces and the limping steps we are taking in understanding ourselves and the resulting gap between the progress of the "outer" and "inner" sciences is perilous and portends ill for the future of humankind. It is because of this situation that we have education devoid of values and science bereft of humanism. The consequence is the constant fear that the results of scientific advances may be used to hurt rather than benefit humankind and life in general and that education may lead to exploitation of others rather than enhancement of one's self-worth. The traditional three steps of education - sravana, manana and nidhidhyasana complete the circle of learning by merging knowing with being, and connecting cognition with conduct. Nidhidhyasana is realisation of truth in one's being and is the crowning climax of educational achievement. Also pure conscious states may be the ground condition for emergence of creative ideas. Therefore, attention to them and to the means of achieving such states may be critically important for educational practices.

Again, in the areas of mental health and psychotherapy, the implication of the existence of states of pure consciousness is enormously important. Inasmuch as pure conscious states are states of realisation of knowledge in which there is no dissociation between belief and behaviour, they are necessarily conflict-free states of profound mental health. Also they could be utilised to bring about positive transformation of the person. The possibility of achieving states of pure consciousness through disciplined effort is attested by

many Indian sages. The possibility of *jivan mukti*, embodied liberation, is endorsed by *Samkhya* and *Yoga* thinkers as well as in *Advaita* and Buddhism.

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Free-willed consciousness in interaction with will-free cosmos: Is there an inconsistency?

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I am talking here of the free-willed consciousness, the primary experience of self-awareness that I cannot doubt, nor negotiate. It belongs strictly in the private domain - inalienable, self-referential, and indeed incommunicable, except through some kind of transference. Clearly, it is not subject to the usual rules of procedure that inform physics (science) - the latter belongs demonstrably in the public domain. It may well be the case that there is, after all, an invincible ignorance of science, as hinted at by A B Pippard (1988), and that one must, therefore, look elsewhere for a proper understanding of the state of affairs. In point of fact, any public debate on this hard problem of free will and self-consciousness leaves me with the hollow feeling that I am somehow personally missing from the discourse - such is the firstperson singularity of the free-willed self-consciousness. But, of course, it is also true that my free will, private-limited as it is, does continually interact with the physical world out there, which is in the public domain. It certainly has neural correlates (Crick 1995), and requires the physical-chemical complexity of the living brain for its manifestation. And, yet it will be a category mistake to identify it with the brain, even though the latter seems to contain it! Thus, for example, it is affected by the relatively simple small molecules causing anaesthesia, by sleep and its disorders, and is presumably co-terminus with death, even though one cannot quite experience the cessation of it. Given this uniquely self-referential human condition, what questions one can reasonably ask, and hope to get an answer for, becomes a sine qua non. (It is perhaps similar to, but much more difficult than, trying to determine the curvature of a gaussian surface while condemned eternally to live confined to it as a water-strider. Of course, one knows now that, in this particular case at least, the intrinsic curvature of the surface can be determined without ever having to make an excursion away from it. In fact the away from it may not even exist). It is my

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thesis here that one such question that we can clearly pose, and hope to resolve, is that of consistency of interaction, namely the following: How free will can, given its absolute privacy, at all interact with the physical world with all its publicity, without subtending a detectable inconsistency in principle. One would have expected a no-interaction theorem of sorts precluding any kind of interaction whatsoever without risking inconsistency. And yet, interact it must, or else be an irrelevant epiphenomenon, or some kind of postulated parallelism, which we believe is not the case. The interaction of the free-willed selfconsciousness with the will-free world should give the former away. It is precisely at this interface that we are closest to it, and still remain on the familiar ground – on our side of it. To this very question, therefore, I now turn in the following.

One could perhaps trivialize this question by asserting that there is really no such thing as free will – its freedom is much like that of what is known to physicists classically as a pure gauge potential that *leaves* the observable quantities unchanged, and hence is of no real consequence. So, it may be that the free will does nothing in particular, and that it does very well! Such a gauge-theoretic viewpoint can, however, be elaborated to advantage, and merits further consideration. But for now, I will let it pass.

Then there is the serious possibility provided us by the condition of infinite sensitivity to initial data, an instability envisaged by Maxwell and recorded in his non-scientific writings (Campbell and Garnett 1882) on free will. This seldom quoted work is in fact the first recorded attempt to rationally derive chance out of necessity, and lays the foundation of what is now celebrated as Deterministic Chaos, common to most nonlinear complex systems including the brain, where an infinitesimally small perturbation or change in the initial condition can evolve to a finite change in a finite time - thus completely out of all proportion to the initial cause, and hence unpredictable. All we have to do now is to postulate an agent - the free will - with just an infinitesimally small range of freedom (small it must necessarily be, for, after all, no leopard can change its spots) and the instability does the rest. It is to be emphasized here that the *initial* in the *initial data* or *condition*, does not refer to any specific instant of time – the instability is all along the trajectory (much like the *clinamen* of Lucretius causing the ever-so-small-a swerve). This is a serious thought. However, I think it must be rejected in its present form. The point is that the very infinite sensitivity (to the initial data) that gives the free will its freedom also

makes it infinitely susceptible to the random physical noise that be, and that can totally swamp it! Indeed, the signal-to-noise ratio problem will make the situation hopelessly random. The freedom of the coherent free will is not the same as the licence of a random noise. One must either protect the former against the noise, or somehow average out the latter, thus leaving the free-willed signal alone. This approach to free will, in interaction with the deterministic physical world, gets around the problem of inconsistency by making the latter undetectable for all practical purposes by virtue of the above infinite sensitivity. (One could alternatively dispense with the free-willed agent altogether and trust the free will to emerge as a property of the unstable complex system, the brain. This raises the non-trivial possibility of synchronizing the individual free wills by synchronizing the underlying chaotic complex systems, namely, the brains. I wonder whether the split-brain experiments are already suggestive of this, if we were to regard the left- and the right-hemispheres, with the corpus calosum severed, as the two distinct individuals).

Finally, we re-examine the general question as to whether or not two subsystems obeying two different rules of procedure (laws) can at all interact without compromising their characteristic integrity, i.e., back-action leading to detectable violation of the rules of procedure in their respective domains, and hence to inconsistency in principle. Surprisingly, such a possibility exists, and one can explicitly construct examples to demonstrate this. Thus, for example, consider the case where one of the two subsystems obeys the Classical (C) Mechanics while the other the Quantum (Q) Mechanics, and that the two subsystems interact in such a manner that the C-Q interaction contains only some complete set of commuting O variables. Then, one can readily show that the C-variables continue to obey the classical equations of motion, while the Q variables continue to follow their own quantum dictates. (A simple laboratory model would be the Stern-Gerlach system, where the particle momentum (C-variable) interacts with a component of the spin-angular momentum (Q-variable), which, in turn, is dotted with an inhomogeneous magnetic field in the Hamiltonian (Sudarshan 1976). This simple example encourages us to explore such interacting model systems that may allow non-trivial action and reaction between two categorically different subsystems without any inconsistency, and without loss of their characteristic integrity.

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The whole discussion above is admittedly in the schematic. We do not specify the degrees of freedom of the free will nor do we specify the variables, nor the space in which they are supposed to vary. But the central problem of free will has been stated – as one of consistency of its interaction with the will-free world of physics, the two being subject to different rules of procedure.

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Beyond 'what' and what is 'beyond'?

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If we agree that the expression 'beyond' has an immediate metaphysical implication, then there are two tools such as 'knowledge' and 'experience' that invite discussion. Because, it is with the help of these two tools that we conceptualise (i) beyond *what*, and (ii) what constitutes *beyond*.

'Consciousness' is one such issue that harbours 'beyond-ness' in terms of understanding and experiencing it. The most interesting feature, if we look at the recent discussions on consciousness, is that the debates fall under either of the two classes - that consciousness can be understood using a reductive pattern, however complicated the processes are, and, that consciousness cannot be understood without involving qualitative criteria, since essentially the test for consciousness is subjective experience. The one question which has become *the question* about consciousness is of 'how physical, discrete, quantitative processes give rise to non-physical, unitary, subjective experience'. This question is now popular as the *hard problem* (Chalmers 1995).

There is an interesting and serious turn occurring in the current discussions on consciousness. This turn is based on and compelled by the intractable relationship of 'consciousness' with 'experience'. The nearest empirical idea for the unity and subjective nature of consciousness is 'experience'. Hence, the scientific focus on 'experience'. The interesting part of the discussions is that, though there is recognition of experience being vital in the study of consciousness, the attempt itself is to strip 'experience' of the qualities which would make it of experiential nature (unitary and subjective) and study it on the basis of empirical standards such as causal connections, neural influences, neural locations, etc. The puzzle in the current discussions on consciousness is that of the persistent conflict between epistemology and phenomenology, which makes it evading, and hence eternally interesting (Menon 2001, 2002).

The "other-ness" and "near-ness" of the unknown

Experiences are mostly characterised by their 'distance' and broadly classified as objective and subjective. We can have a range of experiences, a certain type pertaining to outside objects, and a certain type pertaining to inside objects. When my toe hits a stone, the pain I feel is 'inside', but the stone, which has triggered the pain, is an object outside, which has its own distinct physical properties. The experience of pain is nearer to me than the experience of the existence of the stone. 'Is the perception of the stone nearer to me and does it belong to the same class as the pain' is another question to be looked into. At this juncture of our discussion, what is attempted is to see the broader classification of that which is outside the subject and that which is inside the subject.

Whether it is the existence of the stone or the pain, I provide meaning by relating them to a personal identity:

- (i) [I see that] the stone exists
- (ii) I feel pain

The feeling of pain is nearer [to me] than the existence of the stone. At the same time, the pain as well as the stone are recognized as other than me. There is something unknown about both the pain as well as the stone. The stone as well as the pain are also 'felt' as other than me.

Is consciousness 'unknown' like the 'other' unknowns? This question has been one of the questions responsible in raising the 'harder problem' (Menon 2002) of consciousness.

What does consciousness 'look like'?

Like causality, attributing a name and limiting something to a form, are also ways of the human mind to know the *unknown*. It is also interesting that our minds (and institutions of knowledge creation) use history as a tool (may be because we essentially deal with relative time: past, present and future) to understand and classify new objects of

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knowledge, and, therefore, comparison is as important as uniqueness. To know something new, we first compare it with classified and validated knowledge (by the accepted tests, measurements, etc.) and then allocate them under a category. Therefore, the 'new' is always relative to the 'old'. In other words, the 'unknown' is relative to the 'known'. It is this basic structure of duality embedded in our thinking that helps us to know, to relate and to have meaningful interactions and institutions.

In consciousness studies, we look for measurable physical correlates of qualitative non-physical conscious experiences. The contention is that discrete conscious experiences can be localised and identified by their neural correlates. How much of a conscious experience can be identified and localised by its neural correlate is an important question.

Two kinds of pursuits

There seem to be two kinds of pursuits: The first kind is that which attempts to generate, classify and categorise knowledge for building institutions and understanding various levels of complexities in human behaviour. The second kind is that which does not follow a structured database, but which attempts to transform existing patterns of thinking and experience. The distinction between ways to knowledge creation and ways to transformation is well-spelt out in the area of consciousness studies. Therefore, understanding consciousness, in terms of degrees of intelligence and thereby degrees of self-awareness (based on cognitive and social functions), is as important as practices and philosophies that focus on the transformation of states of mind and experiences.

The problem of consciousness is less about conscious experiences and more about the conscious "experiencer" (Menon 2001). Based on brain and genetic information, we might be able to map the history of life and the evolution of human intelligence. But, unfortunately, this mapping will not be sufficient to understand the principal nature of consciousness, namely self-orientation. The problem of self is not even the problem of degrees of self-awareness (which is accounted for by cognitive abilities and social intelligence), but is the problem of self in and by itself. Ways to understand neural mechanisms underlying conscious experiences and ways to transform states of mind and experiences are distinct by method as well as by their ultimate goals –

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the goal of the first being scientific knowledge about life and intelligence, and the second being spiritual inquiry. The distinction between these methods and goals also brings forth two levels of complexity in consciousness, of the 'I' and of the 'experience'.

Complexity

There is general agreement that it is interestingly perplexing to be conscious and yet not to understand what brings about the phenomenon of consciousness. Let us ask why it is perplexing.

Our knowledge systems are mostly based on cognising the 'other', or at least about an objective world of information or experience which belongs to the 'other'. Mostly, we feel comfortable when prior objective knowledge is available about anything which we experience. To have an experience and still not to know 'how' and 'why' it came about is problematic for us. It cannot be that we do have an experience but still do not know 'what' is there or 'how' it is there. The first-person experience gets a larger agreement of being natural or normal or not-mystical only if it is validated by third-person analysis and representation. The usual way of discourse for us cannot approve of 'having something' without knowing 'what it is' or 'how it came about'. Whether this third-person representation and consensus are necessary for all human expressions, is the question. May be we can have something, have many applications of it, without having the concluding third-person representation of it in terms of causal and local explanations.

The availability of 'consciousness' for our most intimate experiences and yet our inability to understand it *completely* in terms of third-person information influences us to think that 'consciousness' is a complex phenomenon, and that its complexity needs to be addressed. We understand 'complexity' as an intrinsic characteristic of the 'other', the object of investigation, which we attempt to study. This notion of ours about 'complexity' has to be examined.

The tree

I would like to present a 'simple' and common experience in our life. Take the example of the experience of a tree. For focus of attention, let us assume that we will not discuss in detail the experience of the tree in background and foreground terms, but the experience of the tree by itself. When I see a tree, what are the cognitive constituents of my

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experience of the tree? The perception of the tree involves the perception of the individual leaves (however vague or clear they are), branches, etc., and also something which is together seen as 'tree'. There are two distinct parts of the experience of seeing the tree: (i) the seeing of the part, and (ii) the seeing-together. Here, what we are interested in is not in the epistemological explanation of perception, but in understanding a simple experience in experiential terms.

The two distinct parts of experience are there for whosoever perceives the tree. However, the description of the perception certainly changes from person to person in the main theme of his/her experience, focus of attention, distance of perception, level of experience, kind of thinking motivated for, etc. Why is this? The differences are accounted for by the differences in the degree of distinctness and togetherness and their relationship in our experiences. However, we do not see the distinct component or the component of togetherness in isolation. The meaning of the content of experience is not a derivative of any of the components of the experience. It is not a percept, physical or mental. It can only be described as an integrated whole. The object of our experience, the tree in this case, is guite simple by third-person definition. But our experience seems to be quite complex, of having to have a distinct as well as together feeling at the same time, though at no given point can it be said that at that point what is seen is the leaf, branch, tree, etc.

If objects for physical perception, like the tree, cannot be understood in any simple way as to how we have similar yet different experiences, then the problem of experiences together, emotions, feelings, relationships and identity formation is to be seriously considered as to how we understand them.

Binding experiences

Binding experiences has been the single issue in the centre of focus in the last decade of discussions on 'consciousness', crossing disciplines: neurobiological, quantum mechanical, computational, theoretical, psychological, etc. Though the details of what constitutes 'experience' differ in method and perspective, a consensus has emerged that (i) to explain 'consciousness' is to explain 'experience'; (ii) to explain 'experience' is to explain its unity and its binding nature. Following this preliminary consensus, however implicit it is, many discussions took place/are taking place from the first, second and third-person

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perspectives, though the main stream discussion is still dominated to a greater extent by third-person approaches.

Given the complexity of 'experience' as a phenomenon for investigation, or as involved in our understanding, it is helpful to look at alternative views about what constitutes an 'experience' (Menon 2003).

Conclusion

What we consider as 'beyondness' is, perhaps, not something which exists in a hierarchical order but that which actually co-exists. The realisation of 'beyondness' could be in terms of enlarging the scope of human experiences in a larger social and spiritual context. It is interesting that the very word 'beyond' suggests that we need to look for something which is of a transcendental nature. This contention, of course, at some point will question the very nature of experience. Perhaps, it is important to see the *beyond* as something *beside*. Because, when we talk about 'science and spiritual quest' essentially we are talking about some remarkable human experiences. Perhaps, the keywords to understand 'beyond what' and 'what is beyond' are experience and self-exploration and a self-critical appreciation of both.

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On the synthesis of neural Darwinism and affective neuroscience

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Two important contributions to understanding brain function are Gerald Edelman's Neural Darwinism (Edelman 1989) and Jaak Panksepp's Affective Neuroscience (Panksepp 1998), the first dealing with how brain development and function can be well understood in terms of a process of natural selection applied to neural connections, and the second with how neurobiological systems mediate the basic emotions. The theme of this note is that these theories can complete each other in a very satisfactory way, providing a synthesis, whose existence gives strengthened support for each of the theories individually and also providing an extended understanding of important interactions in the brain. In brief: on the one hand, the basic value system crucial to Edelmann's Neural Darwinism, but not fully elucidated by him, can be provided by the affective neuroscience of Panksepp. On the other hand, important aspects of the mechanism implementing Panksepp's proposal that "valenced affective feeling states provide fundamental values for the guidance of behavior" can be explicated by Edelman's Neural Darwinism in a way that fully takes into account current understanding of neurobiology as well as the processes of developmental biology. This proposed synthesis, (which might perhaps be called "Affective Neural Darwinism"), then gives a useful standpoint from which not only to investigate the relations between Affective Neuroscience and Neural Darwinism, but also to reexamine the claims and methods of topics such as evolutionary psychology.

Each of the foundations of this proposed synthesis is compelling in its own right. Edelman argues that generalised principles of Darwinian natural selection ("Neural Darwinism") must apply in the developmental process controlling detailed neural connections in each individual's brain (Edelman 1989, 1992; Edelman and Tononi 2000)¹. This has to be the case for a number of reasons:

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Because, the stored information in the human genome is far too little to control brain development by itself. The Human Genome Project has revealed (Baltimore 2001, Wolfsberg *et al.* 2001) that there are of the order of 45,000 genes in the human genome; but there are about 10¹³ cells in the human body and 10¹¹ neurons in a human brain. Consequently – remembering that this genetic information has to cover development of all other bodily structure as well as the brain – there is not a fraction of the information required to structure in detail any significant brain modules, let alone the human brain as a whole;

- To account for the great variability in human brain structure, contrary to any process of construction according to a preset algorithm (Edelman 1992, pp. 27, 82);
- Because this allows the brain to optimally adapt to the local physical and cultural environment (Deacon 1997, p. 206), while also being able to face up to new circumstances in a sensible way.

has The theory three main elements: (1)Developmental selection, (2) experiential selection, (3) reentry (Edelman 1989, pp. 4-8; Edelman 1992, pp. 81-98; Edelman and Tononi 2000, pp. 79-92). The key feature that concerns us here is that, after developmental processes establish a great variety of connection patterns between neurons, "a process of synaptic selection occurs within the repertoires of neuronal groups as a result of behavioural experience . . . these changes occur because certain synapses within and between groups of locally coupled neurons are strengthened and others weakened without changes in the anatomy. This selection process is constrained by brain signals that arise as a result of the activity of diffusely projecting value systems, a constraint that is continually modified by successful output" (Edelman and Tonini 2000, p. 84, see also Deacon 1997, p. 202). The unit of selection is neuronal groups (Edelman 1989, pp. 43-69; Edelman 1992, pp. 95-99).

This argument extends the Darwinian type of understanding from the evolutionary process that historically led to the existence of the brain to also underpinning both brain developmental processes and brain functioning. This is in accord with the way that such processes

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are now understood to underlie the functioning of the immune system through clonal selection (Burnet 1959, Edelman 1992, pp. 77-78). Thus, such principles are already known to occur in human physiological functioning, giving the same benefits as here: putting in place a mechanism that can deal efficiently with conditions already encountered, but that can also deal adequately with situations that have never before been encountered by the organism. Through this mechanism, "In a very literal sense, each developing brain region adapts to the body in which it finds itself" (Deacon 1997, p.205).

The key issue then is what provides the *fitness characterisation* determining whether particular connections are strengthened or not (in Edelman's terms, the value system guiding the neural Darwinism). In physiological cases (as in the brain and the immune system), this selective function has to be exercised almost immediately; it cannot wait generations (as in the evolutionary case), decades (as in the developmental case), or even days. The answer proposed here is that the key is the *signals provided by the set of primitive emotional functions* described by Panksepp (1998, 2001), thus tying brain functioning strongly in to functions developed by evolutionary processes in our animal forbears, strongly related to survival.

Panksepp presents in this work a careful neurologically based taxonomy of basic emotional processes, each characterised by specific neurotransmitters and associated with activity in specific brain areas. These are the evolutionary heritage we share with many members of the animal kingdom. They have to have a neurological base, so its identification, definitively clarifying which are the basic emotions, is a substantial step forward. They play a fundamental role in human behaviour: "The basic emotional states provide efficient ways to mediate categorical types of learned behavioural changes. . . . emotional feelings not only sustain certain unconditioned behavioural tendencies, but also help guide new behaviours by providing simple value coding mechanisms that provide self-referential salience, thereby allowing organisms to categorize world events efficiently so as to control future behaviours . . . [they] may provide efficient ways to guide and sustain behaviour patterns, as well as to mediate certain types of learning" (Panksepp 1998, pp. 14-15). That seems just what is required to explicate in detail the value system needed by Neural Darwinism (Edelman and Tononi 2000, pp. 87-90).
The basic emotional systems identified by Panksepp (1998) are the following:

- 1. The SEEKING system: general motivation, seeking, expectancy (pp. 52-54 and 144-163).
- 2. The RAGE system: rage/anger (pp. 54 and 187-205)
- 3. The FEAR system: fear/anxiety (pp. 54 and 206-222)
- 4. The LUST system: lust/sexuality (pp. 54 and 225-245)
- 5. The CARE system: providing maternal care/nurturance (pp. 54 and 246-260)
- 6. The PANIC system: panic/separation, need of care (pp. 54 and 261-279)
- 7. The PLAY system: rough-housing play/joy (pp. 280-299)

Panksepp gives a detailed characterisation in each case, including associated key brain areas and neuro-transmitters (for a summary, see Panksepp 2001, p.147). It is these neuro-transmitters that enable the overall mechanism to function in neuro-physiological terms.

These basic emotional systems underlie the higher level systems that develop in the brain (Panksepp 1998, pp. 300-323). Various inputs to the seeking system to do with thermal balance, hunger, thirst, sexual arousal etc., enable it to provide the basis of maintaining homeostasis. The seeking system also drives the basic impulse to search, investigate, and make sense of the environment. The foundation of learning is then provided by satisfaction or dissatisfaction associated with the success or failure of one's endeavours as motivated by the seeking system. Presumably, as brain development takes place, this underlies the development of modules that carry out specific tasks to aid these functions, in particular modules that anticipate what may happen by means of some kind of modelling of the external world. This makes explicit the way in which emotions underlie rationality, extending the understanding of the significance of emotions beyond that recognised by Damasio, namely. (i) the production of a specific reaction to an inducing situation, and (ii) the regulation of the internal state of the organism so that it can be prepared for a specific reaction (Damasio 2000, pp. 53-56). However, the above proposal agrees with his statement that "emotions are curious adaptations that are part and parcel of the machinery with which organisms regulate survival" (Damasio 2000, p. 54). They do so both in the short term through facilitating homeostasis, and in the long term through facilitating the development of intellect. In this way "all mammals, indeed all

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organisms, come into the world with a variety of abilities that do not require previous learning, but which provide immediate opportunities to learn" (Panksepp 1998, p. 25).

A theory of Affective Neural Darwinism as briefly outlined here would provide sound links between evolutionary theory, neurology, developmental biology, and aspects of psychology and ethology, so it should be worth developing in more detail. Issues that arise include the following:

First, checking the proposed integration from both sides, checking its compatibility with both the ideas and details of Neural Darwinism and of Affective Neuroscience. As outlined above, they should turn out to be very compatible.

Second, considering the relation between primary and secondary emotions (Damasio 2000, pp. 50-51). How are secondary emotions implemented? On the view put forth here, they would arise through the effects of the primary emotions on the brain in the course of social interaction, the primary emotions being our genetic heritage from our animal forbears. But then, which are secondary and which are primary? Those listed as primary must be sufficient to underlie development of present day intellectual and emotional capabilities, including the secondary emotions. On this basis, one can suggest two additions to the list of primary emotions: namely,

- 8. The RANK system: rank/dominance/status/attachment in the social order,
- 9. The SHAME system: joyful/shameful response to social approval/disapproval.

These are plausible extras, first because higher animals are social beings and, for example, primate studies show evidence of such emotional activity (see e.g., De Waal 1996), which are thus part of our evolutionary heritage, and second because without them it seems difficult to construct the link to sociality providing the basis for the secondary emotions and the associated modelling of the behaviour of other beings (as famously indicated through the existence of mirror neurons). Indeed, it is difficult to see how these significant functions can arise if they are not primary. Thus, one can propose to search for such basic modules as additions to the Panksepp list, using broadly the same methods of search and characterisation.

Third, the key issue of language and symbolism separates humans from all other animals (Deacon 1997). There must be a significant difference in the way the seeking system operates in humans, as opposed to that in all other animals, in order to allow language development in conjunction with the vocal apparatus allowing speech and in collaboration with the other emotional systems, for example, the fear system that leads to distress and warning calls. This difference may lie in greater or more effective re-entry than in the higher primates, or possibly in the implementation of the seeking system itself. This mechanism must provide the basis for brain-languageculture co-evolution (Deacon 1997, pp. 321-464), the top-down view of which is described by Berger and Luckman (1971). As argued above, there is not sufficient genetic information available to specifically determine construction of language modules (Pinker 1994), but rather the mechanisms to develop such modules must evolve (Edelman 1992, pp. 241-252; Deacon 1997, pp. 327-365; Panksepp 1998, pp. 331-335). In any case, the point is that if Affective Neural Darwinism is valid, then the processes involved in language and symbol development should be consistent with the basic mechanism suggested here, and the crucial difference in its implementation between primates and humans should be locatable. A further important issue in terms of both symbolic development and technological outcome is the development of mathematics. There are suggestions that a basic numeric module may exist in animal minds (Dehaene 1997, Butterworth 1999), and hence be part of our long-term genetic inheritance. Investigation of how this relates to the seeking system may be rewarding.

Fourth, this suggestion may provide a revised basis for evolutionary psychology proposals (Barkow *et al* 1992; Mithen 1996; Cosmides and Tooby 2000)², tied in a tight way to neurology and basic emotional attributes. The tension is between what is inherited from long before the hunter–gatherer era and what was developed at that stage, noting again that genetic information cannot specify specific brain modules in detail, as well as the weakness of the proposed evolutionary psychology causal link, if one accepts the anti-Lamarckian implications of the central dogma of molecular biology (nothing we think or do affects the genes we hand down to our progeny). The issue is what kinds of alterations to the generic developmental mechanisms underlying brain structure are likely to arise in the hunter–gatherer stage that could facilitate specific behavioural outcomes. The mechanisms suggested here are relevant.

The synthesis suggested here could, perhaps, also help in construction of evolutionary game theory models more closely tied in to real operational mechanisms than is the case at present.

I thank the members of the University of Cape Town Consciousness Study Group for helpful discussions, and particularly David Kibel for drawing my attention to the writings of Panksepp.

End Notes

- 1. While the primary source is the technical treatise (Edelman, 1989), the more popular references cited here give a more accessible view of the envisaged processes. See also Deacon (1997, pp.193-224 and 457-458) and references given there (p. 487).
- 2. For a critical comment, see Panksepp and Panksepp (2000).

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Preliminary case for a hypothesis of the superconscious

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Introduction

In this paper, I wish to make a case for the hypothesis of the superconscious. This appears to be a highly esoteric subject and making a logical case might appear to be an impossible task. I like to show that this is not the case.

At NIAS, we prefer to follow a path that lies in between the extremes of superstition (in which, I would certainly include ideas such as astrology), on the one hand, and logical positivism on the other hand.

What I have claimed here is that even if we restrict ourselves to the well-established works of psycholinguists, psychologists, etc., on the one side and the recent results about the paucity of the number of human genes and a short time of evolution, then we arrive at a serious need for reconciliation.

This problem seems to make it a logical necessity that there must exist some sort of simultaneous co-evolution of mechanisms of transfer of implicit knowledge, linguistic skills and collective unconscious, and a gradual collective accumulation and growth of these. This also points a way to the possibility of an emergent super soul.

In what follows, we begin with an imaginary "meeting of minds" of experts from various fields. We see that they seem to make contradictory assumptions about one another's fields. Then I describe a way to resolve these contradictions and extend the conclusions further.

Problem of reconciliation

This work began as a result of what seems to be routine activity at NIAS. I was looking at a range of disciplines from psychology to

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information theory. I asked a simple question: What are the commonly held assumptions that one discipline makes about a discipline that is outside of its own scope?

Usually, people busy with their own work are not aware of these cross-disciplinary assumptions. So, I even went through a "thought experiment" of imagining what surprises might we find if several of the experts from each of these disciplines were to meet.

In what follows, we first see that the situation is similar to many people claiming title to the same land, not being fully aware that the land is small and that others are also claiming it.

Claims of psychologists

We begin with psychology. Most psychologists would agree with Freud that we can divide our mental framework into two parts. One is the CONSCIOUS part. It is personal and somewhat private, but something that the specific individual perceives as something he or she is fully aware of. The other is the SUBCONSCIOUS, which we are not fully aware of, but measurably influences our behaviour.

There is a very strong case made by Jung and his followers that there is a deeper part of our mind called the COLLECTIVE UNCONSCIOUS. This one is commonly shared by all of us, across the ages and races. There are a lot of studies showing a fair amount of cross-cultural validation. This idea has been used to explain many rituals, literature, art, etc.

What is the unconscious supposed to contain?

The unconscious is supposed to contain various "archetypes", such as the "animus" and the "anima" which govern our relationship with persons of the opposite gender. The detailed description of these two archetypes alone contains a very elaborate elucidation. It would appear that plots for hundreds of novels lie coded in our unconscious and literature is a mere "unfolding" of these codes set to the rhythm of prevailing norms and culture.

Jung counted over 50 specific persons (e.g. the "mentor") who reside in our collective persons. Even the notion and an innate deeper understanding of the concept of God is supposed to be a subset of the collective unconscious.

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Now, supposing, in our planned dialogue of experts we were to bring in an information theorist, he would be astounded at the amount of the bits of information all of this is supposed to represent. But as long as in this "thought conference" of ours there are only two experts present, namely the psychologist and the information theorist, there is no crisis at all. They will both expect the genes to carry this entire information load dutifully. In fact, they cannot see why there should be any problem because undoubtedly, at least the psychologist has heard of the work of socio-biologists who claim that almost all the complex behaviour of animals is genetically determined.

I will at once admit to a personal bias. At this conference of mine, I would not invite the socio-biologists, although, if invited, they would only strengthen my case. This is because I do not judge their work to be well-established.

Claims of philosophers

The theme of unfolding originates from Plato. "All learning is remembering", he has said. I personally find this theme quite attractive in understanding mathematicians. All mathematics seems to be a fancy elaboration of what we already vaguely know.

Same with literature. How does a male author know what are the innermost thoughts of a female? As the words in the song "killing me softly" express: "telling my whole life with his words…"

Same question is to be asked again: "Where is all this stored, how did it get there, how was it transmitted?" Problems with Darwinian mechanism.

Claims of psycholinguists

Chomsky made a strong case to refute the Aristotelian concept of a child's mind being a blank slate ("tabula rasa"). If this were to be the case, he claimed that a child, while learning his mother tongue, does the same amount of inductive reasoning as all the physicists, from Archemedes to Einstein, combined. So we are definitely "wired in" for our ability to learn language he says. Recently, Steven Pinker has further elaborated on his ideas and come out with the notion of the "language instinct".

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Claims of biologists

So far the responsibility for all these was being shifted to the genes. The shock comes form what the biologists are now finding. When the human genome project was completed, we are found to have only 40,000 genes. Of these we share 99 percent with chimpanzees. So, we have only 400 genes to be uniquely human, including a fewer of these to be Mr. so and so with blue eyes and an inherited tendency to Tey Sacks disease and diabetes!

At one time biologists believed that one gene codes only one protein. Luckily, things are a bit different now. But one thing is quite clear: there just is not enough room to rigidly code all this information.

Darwin vs. Lamarck

The problem comes in because the biologists assure us that Lamarck, who believed that acquired characteristics can be passed on, has been soundly discredited.

Now, mathematicians will point out to us a problem of "convergence". There just has not been enough time for the language instinct alone to develop through pure mutations and spread over the entire globe, let alone many other human traits.

Here we have the problem of what communications engineers would call the question of "broadcasting". It is useless for one person to own a telephone. It is useless if by chance only one child learns to utter some new words.

Two thought (less) experiments

To set up the argument that follows, let us think about two thought experiments: The first one is quite atrocious and is used only to make the point which is more clear in the next experiment: Suppose we have 1000 test- tube babies raised in artificial wombs by aliens on another planet. Would they develop any language, will they share a collective unconscious, will they be "human" in any sense of the word?

The second experiment can easily be carried out and we can readily predict the result: Think of an island with no internet connection, we take to it 1000 of the latest computers with blank hard discs used by educated people. No word processor, no spreadsheets.... What can you do with such computers?

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What is the computer without added software? Some number crunching and some ability to communicate with other computers and store information. It is clear that such a set of computers is no better than the most primitive computers which are 20 years old, but have "learnt" from their predecessors in transfer of software.

Looking at another evolution

Therefore, we need to look at another evolution: the evolution of computers.

Computer hardware developed to communicate more effectively. Hard disc sizes increased. Newer ways to communicate between computers developed. Software evolution followed a very different path than that of the hardware. Broadcasting was essential. Linux development is not at all social Darwinian. This evolution is cooperative individual egos are suppressed. In some ways Linux is larger than all the developers.

So, our key conclusion is that "The computer is merely a matrix ("a shareera") in which software is embedded".

Emergent properties

This theme grew out of a talk I gave at NIAS: "Understanding the Souls of Mathematics, Physics and Engineering". There, we talked about "meta entities". All that is required out of these entities is that they should have the ability of persistence. A simple meta-entity is fire. Although the chemicals which take part in the creation of the fire keep changing, we can identify a persistent entity which we choose to call fire. Persistence, therefore, creates meta-entities that have their own life, death and growth. We can use the term "matrix" of "shareera" as that which embeds the meta-entity. In this example, the chemical particles play this role.

Other examples of various meta-entities are as follows: 1. A river 2. An individual or animal 3. A corporation 4. A traffic jam 5. An epidemic 6. A language ("As we learn a new language we acquire a new soul") 7. A nation 8. Gaia (the earth goddess for which the animate and the inanimate objects form the matrix, just as the living cells form a matrix for an individual).

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Game theory

We know from the relatively recent results from game theory that pure competition (e.g., Adam Smith and Darwin) leads to Nash equilibrium and cooperative search leads to Pareto optimality. If one child learns to share, as a mutation, it would probably lose. Via the unconscious or even the sub-conscious, a meme evolves with a different survival rules. Even altruism can be broadcast, we might all be brainwashed in some sense. Windows spreads because your friends have the same operating system.

Darwinian ethics versus meta-soul ethics

There has been a sharp division between ethicists, including various religious scholars, and Darwinians and free market economists. The notion of meta-entities and the emergent notion of the meta-soul logically leads us to an alternative formulation of ethics which is free from such a conflict. Because it is clear that such ethics would suggest

- 1. Mutual dependence
- 2. Positive synergy (the more people have the telephone the better)
- 3. Survival of meta-soul requires connection with raw material, a matrix, a shareera body, but the relative roles can change: figure becomes ground.
- 4. Love (Goethe)
- 5. Happiness and mental well-being
- 6. Collective unconscious also carries meta-soul entities, God (Answer to Job, Jung).

The other evolution

So, here in brief are the characteristics of the parallel alternate evolution which we can propose:

- 1. Once a connection is broken, information can be lost, fire is extinguished. Thus the test-tube babies would hardly grow up to be human.
- 2. Growth builds exponentially, starts very slow.
- 3. But, once the meta soul grows, stabilizes and creates rewards for its sustenance, an inexorable march is generated that gathers momentum.

This is what happened to computers, with the exponential growth of hard disk sizes, and I believe happened to humans with the exponential growth of their front lobe sizes.

Where and how is the information transmitted?

So I am tempted to discard the possibility that the genes carry the unconscious or that they carry the full structure of the language instinct.

The alternative possibilities are that the genes carry protocol for communication, but actual communication could be via (1) mother to fetus, (2) adults to children, (3) adults to adults.

What are the mechanisms for this? Probably there are multiple mechanisms. Most might be shared with animals, at least with primates. We need to search for and validate these.

It is clear that, if such mechanisms ever developed, they would lead to a significant survival advantage for the subgroup that possesses it. A mother would communicate language to all the children simultaneously. Acquired characteristics can be communicated, hard disk to hard disk, i.e., the front lobal part of the brain to the front lobal part of the brain as a collective shared memory of culture. Some of this can spread fast to become universal, as in the universal grammar of Chomsky or shared collective unconscious of Jung.

Superconscious?

At this point, it is not really such a big step to see the possibility of these alternative mechanisms of communication establishing a metaentity called a superconscious that would reside in a matrix that consists of a large number of individuals, just as thousands of Pentiums get connected these days to solve a prime number search.

Conclusions

If the work of psycholinguists, psychologists, etc., is to be reconciled with the paucity of the number of human genes and a short time of evolution, then there is a need for simultaneous co-evolution of some sort of sensory mechanism of transfer of implicit knowledge, linguistic skills and collective unconscious, and a gradual collective accumulation and growth of these seems to be a necessity. This also points a way to the possibility of an emergent super soul.

Cosmology and Biology

- How did the universe begin? Modern cosmology and the Islamic tradition
 Bruno Guiderdoni
- Towards the future in cosmology, consciousness, and religion *Jean Staune*
- Universe from beyond: Role of unobservables in science C S Unnikrishnan
- Science as an evolutionary product Vidyanand Nanjundiah



How did the universe begin? Modern cosmology and the Islamic tradition

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As is well known, the fundamental principle of the Islamic tradition is the strong affirmation that God is unique, and that He is simultaneously known and worshipped through many different names. There is only one God, the God of the whole Human kind, in spite of the differences in the dogmas and rituals of the various religions. God is beyond our grasp, and at the same time He is present in the world. He is transcendent and immanent. Among His names, God is called the Creator (*al-Khâliq*). He created the world "out of nothing" (*min ghayri sha'in*). We must understand here that the act of creation is a metaphysical action. God continuously sustains the things into the realm of existence, over nothingness. Without this continuous "renewal of creation" (*tajdîd al-khalq*), the things would fall back into nothingness, where they come from. "Each day some task engages Him" (Koran, 55:29).

God is hidden, but He is also apparent, according to His beautiful names *azh-Zhahir wa-l-Batin*. The Creator is so great that His creation has no flaw. But, He is also apparent in/through His creation. For a believer, the world is intelligible, because it is created. The Koran strongly recommends us to meditate upon the Creation to find the traces of the Creator in its harmony. Hence, the so-called "cosmic verses" which are frequently quoted as one of the intellectual miracles included in the Koranic text: "In the creation of the heavens and the earth, and in the alternation of night and day, there are signs for men of sense; those who remember God when standing, sitting and lying down, and reflect on the creation of the heavens and the earth, saying: 'Lord, You have not created this in vain. Glory be to you! Save us from the torment of the fire" (Koran, 3:190-191). The exploration of the world is encouraged, provided the explorer is wise enough to acknowledge that the harmony that is present in the cosmos originates

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in God. By looking at the cosmos, the intelligence God has put in us constantly meets the Intelligence He has used in creating the things. The Koran mentions the regularities that are present in the world: As well as "you will find no change in God's custom" (Koran, 35:43), "there is no change in God's creation" (Koran, 30:30). Clearly, this does not mean that the Creation is immutable, but that there is some "stability" in Creation that reflects God's immutability. The reader's attention is also drawn to the "numerical aspect" of cosmic regularities. The Koran says: "The Sun and the Moon [are ordered] according to an exact computation (husban)" (Koran, 55:5; see also 6:96, 10:5, 14:33). So, a Muslim cosmologist is not surprised that the laws of physics we design and use to describe cosmic regularities are based on mathematics. The Islamic doctrines also teach that God created the Human being (male and female) as His vice-regent on Earth. As a result of this duty, the Human being must act on Earth as a good gardener in the garden. We all share the same spiritual nature, and we are all called for knowledge, which is the purpose of our lives.

What is the connection of this religious world-view, which is basically shared by the Jews, Christians and Muslims, with the data of modern science? According to a commonly acknowledged idea, science deals with "facts", whereas religion deals with "meanings". If science attempts to answer the "how" and religion the "why", there should not be any conflict between the two. Unfortunately, the situation is not so simple. It is true that science deals with *efficient* causes and religion with *final* causes, to use the technical words of the Aristotelian philosophy.¹ But the general trend in the development of sciences is that the efficient causes push the final causes backwards and eventually eliminate them.

This progressive replacement of the explanation in terms of final causes by the explanation in terms of efficient causes has been happening in the West since the Renaissance. In the Middle Ages, Jews, Christians and Muslims shared the same prospect on the world, even if there were already long-lasting controversies and hot debates on cosmological issues. The men and women of faith of the Middle Ages did not see only things and phenomena around them: they primarily contemplated symbols, and looked for spiritual unveiling through their study of the cosmos. The epoch of the medieval synthesis between the Aristotelian–Ptolemaic cosmology and the teachings of the Holy Scriptures has passed away, and the development of modern science has led to a profound spiritual crisis in the West. The Human has lost

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his central place in the cosmos, and has been rejected onto a standard planet orbiting a standard star in a standard galaxy located somewhere in the dull immensity of space. Such a science is value-neutral and devoid of any meaning. To quote it in the words of Claude Levi-Strauss, "The universe has meaning only with respect to the Human, and the Human has no meaning".

The conflict between science and religion ceased in the West, when religion admitted that it has nothing to say on cosmology. The fields simply do not overlap because science has colonised the whole of "reality". To do so, it has defined "reality" as being only what can be studied scientifically. Theologians now have to explain why God appears to be hidden under the thick curtain of the phenomenon.

Is there something new with the results of modern science? I would like to briefly illustrate how the relationship between science and religion can be articulated, by taking as an example the recent developments about structure formation in modern cosmology. To my eyes, this example nicely shows the dialectical interplay between efficient causes and final causes in the quest for scientific knowledge.

Everybody should be aware that we are living in a very peculiar epoch for the understanding of the structure and history of the cosmos. In the last decades, there have been spectacular breakthroughs mainly due to the extraordinary development of observing techniques. As a consequence, we have acquired a treasury of images that we are the first generation to contemplate: the image of our planet in the darkness of the sky, the wide diversity of appearances of the surfaces of other planets and satellites in the solar system, the mapping of our galaxy at all wavelengths, the discovery of very energetic phenomena such as star explosions, or the potential census of billions of distant galaxies in deep surveys. We now have access to distances, epochs and structure sizes that were simply unthinkable in the epoch of the Middle Ages, when the Arab astronomer, al-Farghani, computed the distance to God's throne from the assumptions of Ptolemaic cosmology, and found a value of 120 million kilometres (Grant 1994). The new images of astronomy have deeply changed our awareness of the cosmos.

To understand the structure of the universe, the cosmologists must track its history. This history is theoretically reconstructed from the data by means of elaborate mathematics. No doubt, there is a good deal of bold speculations and crazy ideas in the interpretation. But reality

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resists, and not all theories are in agreement with the facts. On the contrary, the standard theory now appears as a powerful tool to guide new discoveries. To cut a long story short, cosmologists now think that the universe is expanding, and that the expansion phase started from a dense, hot stage called the Big Bang. During the expansion, the matter/radiation content of the universe dilutes and cools, and the relative abundance of various species of elementary particles change. About 100 s after the Big Bang, light nuclei begin to form. About 1 million years after, the universe becomes neutral and transparent, and the light emitted by the so-called last-scattering surface at that epoch is observed as the 2.725 K black body radiation of the cosmic microwave background. The story is now well-documented. However, there are several topics for which our incapacity to solve recurrent puzzles probably points at the metaphysical structure of reality. In the following, I would like to briefly address one of these puzzles.

The first puzzle deals with fine-tuning in structure formation. Regions that are separated by more than about 1 arcmin on the lastscattering surface have never been in causal connection before, and should have widely different temperatures, in contrast with the remarkable isotropy that is actually measured. This is the so-called "isotropy problem". Moreover, the density of the universe is close to unity, and the spatial geometry is almost flat, whereas all values for the density parameter are a priori possible. This is the so-called "flatness problem". As a result, our observable universe seems to have emerged for a very peculiar set of initial conditions. In parallel, it is now clear that these patterns are necessary conditions for the appearance of complexity in the universe. For instance, a very large density parameter would have produced a fast collapse in a time scale much lower than the stellar lifetimes that are necessary for the chemical enrichment of the interstellar medium (and the subsequent formation of planets), whereas a very low density parameter would have resulted in a very diluted universe, with low mass structures that are unable to retain their gas. Of course, a philosophical explanation in terms of final causes can be introduced to give meaning to this type of fine-tuning (and other cosmic coincidences gathered under the term of *anthropic principle*) (Barrow and Tipler 1986). It can be divine intervention in a religious prospect, or a natural trend of matter towards self-organisation in a pantheistic prospect. But this is unacceptable for modern science. As a matter of fact, the elimination of explanations in terms of final causes is at the heart of the development of cosmology. The current explanation of the isotropy and flatness problems (and other related puzzles) is that the universe has undergone a stage of exponential inflation that has inflated a small, causally-connected patch beyond the size of the observable universe, and has erased spatial curvature. This explanation avoids the introduction of any argument on final causes about the set of initial conditions the universe started from.

By the same token, the origin of the inhomogeneities that produce the large-scale structures after gravitational amplification is explained by inflation: they are simply quantum fluctuations inflated to macroscopic scales. The problem is that the current theory is not able to predict the amplitude of these fluctuations, which is measured at the relative level of one part on 100,000 ($Q = 10^{-5}$) on the last-scattering surface. When a complete theory of inflation emerges, it will have to predict this value, which now appears only as a free parameter. But, it is already clear that this value is also a necessary condition for the appearance of complexity in the universe. With $Q = 10^{-6}$, gas cannot cool in the potential wells of haloes and no stars can form. With Q = 10^{-4} , galaxies are so dense that frequent stellar encounters hamper the existence of stable planetary orbits, which are a necessary condition for the existence of living ecosystems that draw their energy from stellar radiation. Again, our observable universe seems to have emerged for a very peculiar set of initial conditions.

The cosmologists have a new theory that avoids the introduction of final causes: it is called chaotic inflation. In chaotic inflation, inflation eternally takes place and makes new patches of exponentially inflating space-time that causally decouple one from each other. Subsequently, the inflationary stages turn into the normal expansion phases. In this context, the laws and constants of physics are fixed by symmetry breaking and get different values in different patches. Consequently, with an infinite number of realisations, we must not be surprised that there is at least one patch of the universe that has the values of the laws, constants, and of Q suited to the appearance of complexity. The question of knowing whether this theory is testable is still open.

At the current stage of explanation, the apparent fine-tuning in the universe is not due to a peculiar set of initial conditions, but to the exploration of a range of possible values in various patches of the universe. We simply live in a patch that has values suited to the existence of complexity. But this type of explanation ignores the "power" allotted to the principles of quantum mechanics and the

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fundamental field theory. When an over-arching field theory is developed (maybe some kind of super-symmetric string theory), it will turn out that it has the possibility of generating patches where complexity is possible. So we shall have to push our explanation forwards again to a broader theory. This quest appears to be endless. The irony is that, when cosmologists try to evacuate final causes, they make new theories and discover new phenomena, but they always face the same type of puzzle.

Some cosmologists use the word "universe" for each of these causally-disconnected patches, and the word "multiverse" to name the ensemble of all these patches generated by chaotic inflation. Of course, there is some ideology in the choice of the names. According to its symbolical etymology, the universe is a sign that is directed "towards the One" (*unum versus* in Latin). Do many worlds suggest many gods? In any case, in the mind of some of those who promote the multiverse, the new cosmology seems to be more sympathetic with polytheism than with monotheism. However, all these patches of the universe are actually linked by the fact that they are ruled by the same principles of quantum physics and the same over-arching field theory. For that reason, there is actually a *single* universe. Why are the laws of quantum physics so *universal*?

The existence of fine-tuning in the universe surely tells us something about reality. But what? In other words, what is the metaphysics that is suggested by the discoveries of modern cosmology? Basically, there are two standpoints that are possible. The first standpoint is some sort of "ultra-darwinism". It states that the final over-arching theory might well be very general, a kind of mathematical "ensemble theory", where all the theories that are possible (because they are logically self-consistent) might have a counterpart in physical reality. We only happen to live in the part of reality where the laws of physics have the values that permit our very existence. There is no finetuning, only a gigantic lottery. This interpretation also states that there is a single sort of being, which is the being of the universe. The second standpoint would rather emphasize the mystery of reality. It recognizes the fact that we may be unable to find the over-arching theory, or to test the multiverse (which may be, or may not be). It emphasizes the fact that we find intelligence and love in the universe, as well as in ourselves, though probably not as much as we would have liked to see. So it is not unreasonable to state that ultimate reality also has knowledge and love. God is the name given by religions to this

ultimate reality. There may be some fine-tuning, but God may act also through the lottery, as a way to give existence to the largest number of possibilities. This interpretation also states that there is a single sort of being, which is God, understood as the very act of Being. The other things only participate to the Being of God, in ways that are described in different manners by the various theological schools. As it can be easily seen, the existence of apparent fine-tuning in the universe calls for the existence of an invisible reality, whether it is the multiverse or God himself, or may be both. The Human being can readily understand that it is a divine sign. If he does not, the door is open to an endless exploration of the cosmos that displaces and magnifies the puzzle, till he finally acknowledges it. "Whichever way you turn, there is the Face of God" (Koran, 2:115).

The renewal of creation taught by the Islamic doctrines means the continuous appearance of new creatures. According to the views of the Akbarian school, funded after the work of Muhyi-d-din Ibn Arabi, who died in 1240, the Creation is God's self-disclosure to Himself through the veils and signs of the creatures. The things "are" not, since only God is. They only own a given preparation to receive being and qualities from God. As a consequence, since the status of the cosmos is paradoxical, between absolute Being and absolute nothingness, we cannot expect to reach clear-cut statements about the fundamental reality of the world. The ultimate reality is hidden, and our descriptions will always be approximate.

God is infinite and "self-disclosure never repeats itself". So God's self-disclosure is endless. At each level of the cosmos, there are always new things continuously "poured" into disclosure. What appears in the Creation exactly corresponds to the flow of possible things. This is why, according to the great theologian and mystic, al-Ghazali, who lived in the 11th century, "there is nothing in possibility more wondrous than what is", because what is actually reflects God's desire to show up to us. This helps us understand the Prophetic saying: "Curse not time, for God is time". After all, the production of an infinite number of "patches" of the physical universe described by chaotic inflation could fit in this view of God's eternal self-disclosure. The appearance of "emerging properties" at all levels of complexity, and particularly the appearance of life and intelligence, is another aspect of this continuous self-disclosure. The human being was made possible by many "anthropic coincidences" in the laws of physics and the values of the constants, which fix the properties of the cosmic and terrestrial

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structures. The extension of time behind us and of space around us is a necessary condition for our existence, as well as the vast extensions of the deserts of sand and ice necessary for the ecological balance of the earth. But, this is of little interest in front of our spiritual call for an endless quest: the quest for knowledge that is the core of our nature and dignity.

However, there is a significant difference between the scientific pursuit and the spiritual quest, which deals with the ending point of our existence. Contrary to the scientific pursuit, the spiritual quest is not limited to the intellectual search for truth and the production of useful consequences. It primarily aims at transforming the Human, so that he can be prepared for the Afterlife. Let me conclude by mentioning the encounter between Averroes and Ibn Arabi in Cordoba, probably around 1180. Averroes, who then was already a renowned Philosopher, defended that human reason was able to reach all the truth accessible to the Human, and not less than what was brought by revelation under the veils of the dogmas and symbols for the benefit of those who are not experts in science. Averroes had heard that the young Ibn Arabi had been granted spiritual enlightenment and he was eager to meet him. Ibn Arabi reports on their meeting : "When I entered in upon [Averroes], he stood up in his place out of love and respect. He embraced me and said, "Yes". I said, "Yes". His joy increased because I had understood him. Then I realised why he had rejoiced at that, so I said, "No". His joy disappeared and his colour changed, and he doubted what he possessed in himself". Then comes the explanation of these strange exchanges. Averroes asked the crucial question which we are interested in: "How did you find the situation in unveiling and divine effusion? Is it what rational consideration gives to us"? Ibn Arabi replied, "Yes no. Between the yes and the no, spirits fly from their matter and heads from their bodies". He reports on Averroes' reaction: "His colour turned pale and he began to tremble. He sat reciting, 'There is no power and no strength but in God', since he has understood my allusion".²

Ibn Arabi alluded to eschatology, by recalling that, even if reason can go very far in its attempt to grasp reality, nobody has been intimately changed by one's scientific knowledge. According to the teachings of Islam, we shall have to leave this world at the moment of our death, in order to pursue our quest for knowledge, and enter another level of being which is a broader locus for God's self-disclosure. The Islamic tradition promises that the quest for knowledge will end when the elects contemplate God's Face on the so-called "Dune of Musk"

How did the universe begin ?

(al-kathib) that is located on the top of the heavenly Gardens, at the last frontier of creation. Religion is providentially revealed to prepare us to face absolute Reality, which is another name of God. But this end of the quest will not be the end of knowledge. On the contrary, the elects' contemplation of God will continuously be renewed, as they will know, according to the Koranic verse, "what no eye has seen, what no ear has heard, and what has never passed into the heart of any mortal". Our reason could estimate that this is impossible, since we do not conceive "how" this can physically happen. But indeed, the "Dune" is the locus of the answers to the "why" questions, without "how".

In the expectation of the universal eschatology, we are like pilgrims to the Ka'ba, the holy house in Makka. We are waiting at the threshold of the mystery. We are only able to read God's signs in Nature and in the revealed Books (both types of signs are called *ayat* in the Koran). The marvellous renewal of these signs gives us knowledge about the ultimate reality. This is why Ibn Arabi comments: "God does not become bored to the point that you should become bored". We cosmologists surely understand this allusion, since we are continuously astonished by the beauty of the phenomena unravelled by our new observing tools.

End Notes

- 1. To the question: "Why does the sun shine" ?, an answer in terms of final causes could be: "It shines to give light to the Human being", whereas an answer in terms of efficent causes could be: "It shines because its surface is hot".
- 2. I use the translation by William Chittick in *The Sufi Path of Knowledge*, SUNY.

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Towards the future in cosmology, consciousness, and religion

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This conference marks the end of *Science and the Spiritual Quest*, a remarkable programme of dialogue between Science and Religion and between the different Religious Traditions. On this occasion, I would like to consider a few issues linked to the following question: within the Science and Religion dialogue, what are the most significant advances in our understanding of the field of cosmology and the study of consciousness that might be achieved in the 21st century?

It is possible to consider that all advances in our understanding of the structure of the universe constitute a new kind of spiritual information, as they give us some information on the way God conceived the universe. Here, however, I only want to consider genuine breakthroughs, those discoveries which without proving the existence of God (by definition impossible, if we accept that God leaves us the freedom whether or not to believe in him), lend more credibility to the hypothesis of a designer in the universe or of life after death.

Cosmology

The Anthropic Principle tells us that the universe is finely tuned to support our existence. Proponents of the Strong Anthropic Principle say that it is possible evidence of an intelligent being beyond the universe. Proponents of the Weak Anthropic Principle, on the other hand, say that we cannot conclude any such thing. If we exist, the universe must contain the properties that allow us to exist.

Is it possible to go any further? Even if the universe came about by chance, it still needs to be relatively coherent, otherwise we would not be here to observe it. However, nothing obliges such a universe to be coherent enough to forbid, for example, a civilization from sending information faster than the speed of light in order to travel through time, or creating inconsistencies like the ones we sometimes see in science fiction films (in which, for example, a character can go back in time and murder his own parents). Yet, if this were the case, the universe would show a level of coherence which it would be very difficult to explain without the presence of a designer.

Hence, we propose a 'Superstrong Anthropic Principle':

"If this universe is created by God, the coherence of the laws of the Universe exceeds the minimal coherence that is necessary for the apparition of Life and even the apparition of Human Life".

Predictions made by the Superstrong Anthropic Principle are that:

- Time travel is impossible (it would be a universal bug!!),
- Sending useful information faster than light is impossible¹ (see Jean Staune in *Science and Spirit* 10 (1):16).

There are four experiments in which "something" appears to travel faster than light.

EPR correlations

Aspect's experiments demonstrated instantaneous interaction between particles 12 m apart: a communication time of less than a billionth of a second, or 20 times faster than the supposedly unbreakable speed of light. This was followed in 1997 by Nicolas Gisin, who worked with distances of 10 kilometres and showed in this instance that the speed of the observed phenomenon was 10,000 times faster than the speed of light.

Thus, as predicted by Bell, certain particular correlations are inexplicable locally. That is they cannot be explained without action taking place at a distance, however 'spooky' this action might be. However, it is important to note that we cannot exploit this information in any way, to send messages faster than the speed of light for example. The randomness involved prevents us from forcing the output on one side: we can observe this but not determine it.

Quantum teleportation

These first experimental evidences of ghost links over such distances have been used by others, such as Gilles Brassard and his team, to demonstrate the principle of quantum teleportation. When the first twin of the entangled particles meets a third particle, the second twin receives via teleportation, through the ghost link, the properties of the new particle, even though it has not come into contact with it. Here too it is demonstrated that it is impossible to use such a process to send usable information faster than the speed of light.

Superluminal tunnel effect

Raymond Chiao used two beams of photons which move at the speed of light, both covering identical distances from Point A to Point B. The photons which leave together from A thus arrive at the same time at B. If we put a wall in the pathway of one of these beams, most of those photons are stopped but a small number, as a result of the tunnel effect, do make it through to Point B. Chiao has shown that these photons actually arrive before those which travel at the same time in the other beam without a wall, even though both beams travel at the speed of light and both their trajectories are identical in length. How can light go faster than light? The only possible conclusion, as far as we can see, is that the particle does not actually go through the wall and its molecules, but materialises itself directly on the other side. This dematerialisation could explain why the blocked photons seem to arrive earlier, having effectively skipped the space of the wall. In fact, the experiment shows that the thicker the wall the earlier the particles arrive.

This experiment sparked a considerable controversy when the German physicist, Gerard Nimitz, predicted that it could be used in the future to transmit information faster than the speed of light. However, although many experiments have been carried out in this field, no other physicist shares this view.

So in all the facts we are speaking about, 'something' seems to go faster than light but it is not something we can use for a practical purpose. It seems there are processes in nature that are kept 'for *internal use only*'. This is why the theory of General Relativity is not violated.

Worm holes

In his book *Black Holes and Time Warp*, Kip Thorne describes in detail his efforts to show that time travel through worm holes is theoretically possible. He has often been close to completing his demonstration and each time the process has collapsed as if there was a cosmic censorship. As Stephen Hawking said: "Cosmic censorship is that which makes history secure for historians".

Can we imagine that these different impossibilities are linked? Will it be possible to discover a general principle, an impossibility theorem in cosmology (like the Gödel Theorem in logic) that would demonstrate that time travel is impossible?

This would be an indication that the universe has an internal coherence which is difficult to explain if we suppose that our universe came about by chance and that it is one among thousands of other parallel universes, each with different fundamental constants, as the proponents of the weak Anthropic Principle think.

Consciousness

Is consciousness simply a by-product of the brain?

One of the strangest claims of the past 30 years is that, during a "Near Death Experience" (NDE), some patients were able to see their body (and the environment of their body) from outside. We now know from extensively carried out research that 18% of patients who have suffered a severe heart attack experience something of this kind (Lommel *et al.* 2001). Most of them have described things in the environment of their body that would be impossible to see with their own eyes (Sabom and Kreutzinger 1978; Sabom 1982).

There are many examples of this. For example, in one reported case a woman, coma patient, in a hospital was visited by her brother. Fifty metres from the room where his sister was lying unconscious the man met a friend and explained that he had cancelled a business trip because his sister was dying. On coming round, his sister said "Next time I die, don't bother cancelling your business trip". More unusual are the accounts of blind patients, (before and after NDEs), who have described the colours of the clothes of the hospital personnel or the machines in the operating theatre.

Jean Staune

However, these are only reported testimonies. Only one serious scientific study of these experiences has been carried out by Michael Salom, mentioned above. In his study he asked a sample of patients having survived clinical death without experiencing an NDE to imagine how the process of reanimation takes place. All were significantly wrong in their descriptions in at least one respect. However, the patients who had survived an NDE and who claimed to have witnessed their own reanimation 'from the outside' did not make the same mistakes.

Nonetheless, before it is formally recognised, such a phenomenon must be studied with the utmost rigour. The scientific protocol could be the following:

- 1. Placing a television screen facing the ceiling at the end of each bed in an intensive care unit.
- 2. When the machine used for the reanimation of the coma patient is turned on or when the 'blue code' alarm is on, the screen turns on and a random generator displays a signal that is easily recognizable (e.g., a red circle, a yellow cross or a green triangle).
- 3. The screen switches off at the same time as the reanimation machine.
- 4. As soon as the patient can talk, he is interviewed by a person who has not witnessed the reanimation.

Even if only two people out of a thousand claim to have seen the correct display, the proof will be there, not that there is life after death, of course, (since death is defined as a state from which we do not return), but that during an NDE, patients possess (as if by chance) perception faculties that do not use the normal senses (sight, hearing, taste, touch, etc.,). But it is enough to give some credibility to the claims of many different religions.

In any case our current understanding of NDEs is very relevant to the Science and Religion dialogue. 'This extreme experiment forces us to rethink the location of conscience. Is it really in our brain?' (*Pr. Pim Van Lommel*). Even though there are hundreds of testimonies indicating that this phenomenon could be real, the experiment (except for an attempt by Dr Sam Parnia, University of Southampton, UK), has not been carried out.

Sociological considerations

Why? It is important for the future of the Science and Religion debate to understand this.

I have always been surprised that even strong believers react negatively when I describe this experiment, rejecting, despite the numerous testimonies, the possibility that the experiment could give a positive result.

There was recent progress in the Science and Religion dialogue, but the minds of many people are still blocked by the same materialist presuppositions. One of them is that the brain produces consciousness.

This is why the success in the 21st century of the experiment described here could be the "Big Bang" for the Science and Religion dialogue by overthrowing some of these presuppositions.

Conclusion

We hope we have shown you two exciting examples of very different types of research, which can be generated by questions (e.g. is the universe designed? is the mind solely a product of the brain?) which arise in the Science and Religion field and which have the potential to produce breakthroughs in our knowledge during the 21st century. It's clearly proof that the Science–Religion dialogue is not a vain intellectual exercise, but that it can generate fundamental research in very important fields.

End Note

1. We mean "impossible in our level of reality". If in the future we become like the black monoliths in "2001, A Space Odyssey" then, of course, we will be able to travel faster than light!

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Universe from beyond: Role of unobservables in science

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In this brief presentation, I will try to highlight two main themes and then illustrate them with some examples. This is an entry-level exploration into possibilities of spiritual experience within the process of rational scientific enquiry. I will point out that such a possibility exists while exploring the boundaries and beyond.

My first point is about an inherent "beyondness" in scientific enquiry. My basic thesis is that observables, and what is considered measurable reality, are described in physical theories in terms of certain *unobservables*, the objective reality of which is debatable or indefinite. This seems to be an inevitable structure in all our physical theories. These unobservables then define a boundary and "what is beyond". This is the main theme of this talk.

My second point is the one that connects the first theme to what could be called spiritual experience in the process of scientific enquiry. The uncertain objective reality of the unobservables creates an open territory, the exploration of which can lead to a deep personal experience akin to spiritual experiences, if and when a new reality emerges. Revelation is a source of spiritual experience. Thus, pure scientific enquiry naturally contains a domain that is beyond and can be a source of spiritual experience, all within the process of rational scientific enquiry itself. While I am not rejecting other sources of spiritual experiences, I am asserting that spiritual experiences – a deep awareness or realisation in the process of cognition that is personal as well as unifying – can be and actually is part of scientific enquiry.

To give an indication of what could be called a spiritual experience during observation of the external objective world, a good example I can recall is a description of such an experience by

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Sri Ramakrishna (19th century mystic, and spiritual teacher. Inspired the 'Ramakrishna Mission' order of monks) – his watching a flock of white birds flying across, with thick dark monsoon clouds in the background, leading to a transcendental state. The important aspects to be noted are the aloneness that precedes the vision of harmony and the spiritual experience that follows, signifying union of both internal and external worlds. This experience can transcend and transform.

Now, I illustrate these points with two examples, both involving unobservables that occupy the centrestage in modern physics.

Some of the familiar examples of unobservables in our physical theories are potential, phase, vacuum etc. These are essential concepts for the construction of our most successful physical theories and they are indeed the primary elements of these theories. Yet, the observables – the tangible reality – are always the difference or change in these quantities. If we go deeper we see that *even space and time are unobservables* and the observables are really relational quantities.

Cosmology: A new Universe driven by unobservable dark energy

My first example is from Cosmology. It is a highly evolved discipline. The standard model of cosmology describes an evolving and expanding Universe – the Big Bang Universe. Let me assure you that even a cursory contemplation of the main features of this standard universe and the observed cosmos is an emotionally and spiritually enriching experience. But let us examine the consequences of some new observations.

Estimation of the amount of matter or, equivalently, the energy in the universe is an old problem. It is an important issue, since the fate of the Universe crucially depends on its matter content. If the density of matter exceeds a particular value called the critical density, then the Universe will recollapse. (This concept is similar to the familiar concept of the escape velocity for a projectile shot off from the earth – if the velocity is lower than a critical value, the projectile will fall back eventually). It is important to recognize that this special value of density signifies that the total energy in the Universe – the sum of the positive energy of motion and matter and the negative energy of gravitational binding – is zero, as perhaps, it should if everything started from nothingness. All observations show that the matter that

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constitutes us and our environment and all that is luminous - made of electrons, protons, neutrons and light - is but hardly 3% of the critical density. Why is this a problem? Because, there are other dependable observations that can measure even non-luminous and unseen matter using their gravitational properties, and these observations indicate that, in fact, the density of matter in the Universe is close to the critical density. Then what does the 97% of the (non-luminous) matter in the Universe consist of? What are its properties? We do not know yet. The present inference is that about 30% of this - provisionally called dark matter - is in a form that can clump gravitationally and aid in the formation of the large-scale structures consisting of clusters of galaxies. The rest of the unseen matter seems to be really strange. One important observation that looks at very distant supernovae and measures their speed of recession and also their distance seems to show that the universe is speeding up as it expands. To understand the strange import of this observation, imagine watching a stone that is thrown up, and seeing it speeding up as it rises up! This can happen only if there is repulsive gravity, but we have no experimental evidence in the whole history of physics for repulsive gravity. Yet, we are faced with the situation in cosmology that needs a form of matter that can generate repulsive gravity. The inferred properties of this dominant form of matter is so close to that of vacuum, it could only be the vacuum itself an unobservable! The quantum vacuum in physics is not just emptiness. It is an unobservable containing an infinite amount of energy. An absurd fact, but this is usually ignored because it is considered an unobservable. (The observable quantities are differences in energies of two configurations of this vacuum and such quantities are finite. However, when the dynamics of the Universe is considered, every bit of energy contributes and the concept of a quantum vacuum with infinite or even large energy density becomes discordant). Most recent observations seem to support the view that 65% of all matter in the Universe is "dark energy" – energy that is as strange and smooth as the quantum vacuum, which can provide effective gravitational repulsion (Caldwell and Steinhardt, 2000). So, sophisticated observations have led us to forms of matter that are almost mystical, and certainly the most mysterious we have ever come across. Truly, a form of matter that is "beyond". Not only that it dominates, it will become eventually the only form of matter in the Universe, because of its strange property that it does not diminish as the Universe expands!

This is Copernican principle at its extreme. In the original form, it said that man and earth had no privileged position in this solar system.

Universe from beyond

The generalized Copernican principle applied to the Universe asserted that even the solar system is just one of the infinite equivalent positions in the Universe. Now it turns out that, even the matter that we are made of, is only an insignificant fraction of all matter. This world-view implies a strange alienation. Most of the Universe is "not our kind". But, on contemplation, we also realise that no form of matter is isolated in this Universe. This is a form of Mach's principle, which was originally derived from rejecting a very important unobservable - the notion of absolute space. Each one of us here is influenced by all the rest of the matter in this Universe. Every moving molecule in our body has to overcome inertia - a most fundamental property of matter - and this inertia is nothing but the integrated influence of the rest of the Universe. It is startling to realise that most of this influence originates in matter that is not in us. This generates a feeling of aloneness. But, we also realise our inseparable physical link and the extension that goes over the entire Universe, and this is the source of the spiritual experience I mentioned. All this also points to the preciousness of the matter we are made of. It is rare. We, and our environment, and our cosmic neighbourhood and so on, may not be unique, but are certainly rare. Our integrated world-view should not ignore this, and in fact should incorporate this realisation not only in our science, as we are forced to, but also in our philosophy, and ethics.

Quantum physics and beyond: Beyond quantum mechanics

The next example I take up is related to an unobservable that has created a whole lot of debates, speculations and even philosophies - the wavefunction in quantum mechanics. As far as we know, no objective reality can be ascribed to the wave function. Yet, all observational results are supposed to be potentially contained within it. One of the basic issues involved is that of a non-local influence. One can talk about, and experiment with, situations where there are two particles described together by one wave function and no objective property (definite state) can be ascribed to either particle separately. Such a state is called an entangled state. Making an observation on just one of the particles gives some result and, therefore, a definite property for that particle. Then the other particle simultaneously, spontaneously and non-locally, assumes a definite property, however far this second particle is from the first! That is what standard quantum theory implies. This, of course, violates the basic notion of locality inspired by special relativity (in Einstein's words, "on one supposition we should, in my opinion, absolutely hold fast: the real factual situation of the system S2

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is independent of what is done with the system S1, which is spatially separated from the former"). Quantum non-locality has been a muchmisused subject, though there is no single experiment that shows that there is indeed some non-local influence. (All experiments measure a correlation between two particles, and the conclusion of non-locality is derived merely because nobody had been able to ascribe the observed correlations to some *a priori* cause before the particles separated). In fact, various hard problems facing science and other disciplines in fields ranging from cosmology to consciousness studies have been linked to quantum non-locality, and there are any number of speculations asserting that the clues to solving those problems are in quantum non-locality. Hence, quantum non-locality is one of the most important issues to be addressed and understood. Its understanding is just beyond standard quantum theory, though it arises in the theory.

This is the situation in our most successful theory, all arising from having to deal with a mysterious unobservable. This problem, and its tension with the spirit of relativity, are, perhaps, the most discussed fundamental issues in physics, including the famous discussion by Einstein and his collaborators Podolsky and Rosen (EPR, 1935). Personally, this situation created an intense emotional problem within the process of rational enquiry for me, mainly due to the clash of quantum non-locality with everything else one knows about the physical world. I have ventured into probing the consequences of the unobservables in quantum theory, especially the process of the realisation of an observable result from the unobservable. The emerging conclusion was a source of deep internal transition for me, as the image of the external world transformed; a transition that showed clearly the harmony between quantum phenomena and the ideas of relativity. It is possible to show that there is, in fact, no non-local influence, and no non-local collapse of the wave function. What was thought to be the non-local influence resulted from certain conceptual flaws inherent in the standard way of looking at the problem. This may seem surprising to most quantum physicists. Yet, the proof is simple (Unnikrishnan, 2002). The physical idea of the solution to the puzzle is that quantum particles can have a prior phase relation (a fixed relation in a wave property instead of a relation between properties characteristic of particles). This is determined at their source before they parted, and they can behave in a correlated manner at arbitrarily large distance without non-local effects. A simple argument (Unnikrishnan, 2002) shows that there is no non-locality and, therefore, the standard quantum theory is inconsistent and incomplete, as it

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stands. It is not the final theory of the microscopic world. With the vanishing of quantum non-locality, all speculations about its magical use for solving various problems also vanish. (I should stress that this conclusion does not affect any possible link between quantum coherence and other unsolved problems. What is removed is the superluminal aspect in quantum phenomena). This proof goes just one step ahead of the EPR argument (EPR, 1935), and an argument by Karl Popper (1992), and establishes a fundamental truth about the quantum world.

Finally, one may ask the question whether quantum phenomena could be understood without its inherent indeterminism. This was one of the puzzling features of the quantum theory and the wave function description from the very beginning of modern quantum theory. In the standard approach, the cause-effect uniqueness is broken in the sense that the same initial cause (quantum state) can give rise to a multitude of final results, all occurring at random. I have a tentative proposal that again is related to the properties of the unobservable wave function. It is not clear whether this programme will succeed. The idea is that a particular quantum state that is normally considered as 'the same state' in each of its preparations has an inherent random aspect that makes it randomly different each time it is prepared. This randomness is in its initial phase and by its very nature this initial phase is an unobservable. Thus, when we say that the same quantum state leads to different outcomes, we are ignoring its initial phase, a random quantity. If we include this random phase in the description, it is conceivable, but by no means definite, that the uniqueness of the cause-effect relation is restored in quantum mechanics. Randomness in cause leads to randomness in effect. I am trying to extend the solution of the problem of non-locality - the realisation that, if the particles have a prior phase relation, they can behave in a correlated manner at arbitrarily large distances without nonlocal effects - to behaviour of individual particles. Of course, even if this is feasible, it only means that Einstein's God does not play dice, but for us it is still a dice game, since we can never observe and use the initial phase for our deterministic predictions because, only phase difference and not phase itself is an observable. Yet, such a change in quantum theory can lead to a tremendous change in our world view and philosophy, since the indeterminism in quantum theory has profoundly affected philosophies earlier. Again, we see how rational critical enquiry within the domain of science itself can be a potential source of personal as well as collective realisations akin to spiritual experience.

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What is "beyond" could very well become "within" in the natural and slow expansion of science. Rational enquiry is, perhaps, the ultimate spiritual quest.

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Science as an evolutionary product

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Nothing in biology makes sense except in the light of evolution. Theodosius Dobzhansky (1900-1975)

Life

Being alive is a property of spatially limited aggregates of matter that can (a) reproduce, (b) assimilate energy and information from the environment, and (c) evolve by natural selection. All forms of life are special in their own way, because they have different evolutionary histories. Other than in this sense, human beings should not be thought of as exceptional creatures; unless, obviously, there are sound arguments, based on objective grounds, that compel one to do so. The supposedly objective grounds lean on what are broadly termed cultural traits. These are traits that are supposed to be consequences of our complex brains. They are said to be possessed by human beings, but not by any other forms of life. Language, music, mathematical ability, formal learning, agriculture, processing food, a complex social life and what are called life cycle (or life history) rituals are cited as examples of traits that are uniquely human. However, when one examines the matter closely, it turns out that things are not all that clear. Language (and not just the ability to vocalize, which is a different thing) may well be unique to humans today, but there are grounds for believing that the 'language instinct' has evolved as humans have evolved (Pinker 2000). Music may have had antecedents in something like bird song; other animals can count after a fashion; termites invented a form of agriculture long before us; and complex social behaviour is at least as old as some soil amoebae (Wilson 1975). In short, while it would be silly to say that there are no characteristically human qualities, one can confidently assert that culture is not a property of humans alone. The reason is that culture too is a product of evolution (Bonner 1980).
Evolution

Life has existed over a period of at least 3,500 million years if not longer. During this period it has evolved. Extremely simple organisms, simpler even than the bacteria we know, have given rise to very complicated creatures like plants and animals including ourselves (Futuyma 1986). The most plausible explanation that we have for evolution is called natural selection. Darwin and Wallace first explained how it works (Dawkins 1986). The principle of evolution by natural selection states that, if certain assumptions are true, a particular outcome follows. The assumptions are expressed by the words variation (the individuals belonging to a species are not all alike with regard to their traits), heritability (traits can be passed down: children resemble parents) and differential fitness (some heritable traits enable individuals to have more children than others). One outcome of natural selection is something known as adaptation. Adaptation means that the individuals belonging to a species are, from an engineering point of view, 'well designed' with respect to their environment (Lewontin 1978). The scientific study of evolution involves examining how valid the assumptions listed above are, in respect of a given trait of interest. Precisely because, such an examination can be carried out, it is wrong to say that natural selection is a tautology. Indeed, there are examples of evolutionary change having occurred without the intervention of natural selection. Also, as Darwin pointed out, certain evolutionary outcomes, were they found to occur, could never have come about by way of natural selection. The example that he gave was of a heritable trait in individuals of one species that existed solely for the benefit of individuals of another species. As far as we know, such a trait does not exist.

The ultimate cause of evolution is that living creatures can reproduce, can make copies of themselves. The most fundamental unit that is copied is a molecule of DNA or a gene. In addition to getting copied, a gene carries (in an encoded form) the message for making a particular protein. The set of all the genes in an organism is called its genome. The genome specifies all the proteins that the organism can make, and thereby specifies a great deal of what goes into building the organism. Suppose a particular trait helps an organism to be more efficient than, which is to say have more offspring than, the average member of its species. This will indirectly result in some genes (the genes in that organism's body) leaving behind more copies of themselves than other genes of their kind. If the supply of food, or an essential resource (such as space) is limited, organisms that are

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consistently less efficient than the average will become extinct in the long run. The more efficient ones will persist and be engaged in a constant struggle, to do better than others. In the course of this struggle they will make use of any strategy which comes in handy and can be passed on, via their genes, from parent to offspring: the ability to breathe air, the ability to lay eggs with a protective shell, the ability to fly, the ability to react fast to danger, and so on. There is no purpose, guidance or direction behind the evolution of these various strategies, which are tried out by means of genetic changes at random. The success or failure of an evolutionary step is decided by the consequences of the step. One might say that the genome 'remembers' those strategies that work and discards those that do not. In this sense, the hereditary changes which underlie evolution can be described as occurring due to a form of genetic learning.

Because of evolution, life on earth has been subject to gradual modifications in the course of time. By accumulation, the modifications have resulted in major changes. If one could see every creature that ever existed, a 'principle of continuity' would link them. But species tend to go extinct more often than not. Because of this, the major changes that have taken place in evolution give rise to a mistaken impression. The impression is that species are distinct entities (which is true) separated by gaps (which is untrue). One believes that the gaps can be bridged, very likely smoothly, but to do so, one needs to go into the past and take into account those species which were the ancestors of those that are alive today. When this is done (with the help of a host of sophisticated techniques), different species can be thought of as relatively close or relatively far apart. A measure of the distance that separates them is how similar or how different they are in terms of their traits. But the more fundamental measure of distance is how related they are by common descent, that is, how recently or how long ago they last shared an ancestor.

The brain

The brain is a specialised organ in our body made up of a huge variety of cell types – known as nerve cells or neurons – with one common property. All neurons can receive, store and process information by sending impulsive electrical signals to each other. The ability to develop nerve cells and organise them to form a brain is something that has evolved (Dethier and Stellar 1963). The brain is a specialised collection of cells within the body of animals, and, in this sense, it is no

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different from the liver or the kidney. But the brain enables us to communicate with one another and even communicate with ourselves, which is what thinking is. Animals with brains can evolve more elaborate strategies in the struggle for life than those without brains. The possession of brains enables animals to make use of what they learn in the course of their lifespan: a form of learning which is both more rapid and, on the whole, more versatile, than genetic learning. Culture, as we know, it would have been impossible without nerve cells or brains.

There is an interesting consequence of having brains. Because, we are able, with our brains, to think about ourselves, to think about the past and future, and even to think about thinking, we tend to believe that there is something else that governs our thoughts and actions other than the physical brain. Some people call this the mind. However, there is no reason to believe that any such entity exists apart from the brain (Griffin 1992). This does not mean that it is uninteresting to think about the mind or uninteresting to imagine that mental properties could be fundamentally different from properties of the brain. After all, people claim that their life is enriched by imaginative fantasies, creations of the brain: art, literature, poetry and religion for example.

Science

Doing science is possible because we have brains. Once creatures with brains evolved, it became important for them to try and find out everything they could about the world. Initially this was because it would help the creatures plan better strategies for survival; later on, it became a self-satisfying task for the brains themselves. Curiosity and a desire to know must have had strong selective value. The desire to find out everything about the world, a desire born out of evolution, has extended to a desire to find out how our brains work. Ultimately, the behaviour whose goal is 'finding out' is what we call science.

It is usually taken for granted that doing science is a peculiarly human endeavour. Is it possible that what we call science might have had evolutionary antecedents? Let us try to analyse this question by noting that scientific activity is a form of behaviour. In general, we behave in ways that depend in part on our hereditary makeup and in part on learning and experience. So do other creatures. Behavioural differences can be correlated with differences in the genetic constitution, differences in nervous systems, differences in history and differences in the environment

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(Manning 1972). The evolutionary success of our ancestors must have depended on their behaving in ways that improved their chances of survival and reproduction. That would have required responding appropriately to environmental stimuli. Stimuli that recurred frequently would have favoured stereotyped responses. In turn, that would have favoured the ability to learn, remember and recall. Chemical learning, based on the ability to sense the presence of chemicals and associate them with certain signals, was almost certainly the primitive stage, and it was followed by neuronal learning.

Especially in situations wherein an inappropriate response could result in a threat to one's own life or to the life of one's child, but also otherwise, it would have been important to internalise simple rules of behaviour. The rules would have to follow from a knowledge of the objective laws followed by inanimate matter and from a careful observation of regularities in the living world. In part the rules would consist of contingent actions; and in part they would be probabilistic. The ability to construct internal representations of the external world must have been of evolutionary advantage quite early in the history of complex life. All this would have been aided enormously by the evolution of nervous systems that contained organs for the sensing, processing, storage, retrieval and transmission of information - by the evolution of brains. The ability to form simple associations would, by the reinforcement caused by successive concordances, give rise to the ability to carry out inductive reasoning. The ability to form internal representations would have been crucial in another respect. It would have aided the evolution of behaviours that were important in interactions with other living creatures, not least members of one's own species. In any given situation, the behaviour exhibited by a creature would be based on the most feasible assessment of that situation. It would be what we call rational behaviour. One aspect of the scientific method is nothing more than a codified, rational, behavioural response to a perceived problem or puzzle. Thus, a rudimentary scientific method is part of our evolutionary heritage.

Irrationality

Living creatures, with or without nervous systems, are shaped by natural selection to try and understand the external world. Because of the way they have evolved, they are led to construct rational explanations of objective reality and then to act on the basis of that explanation. Such an approach to the world – the scientific approach –

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is vital for survival. Why then are many human beings manifestly unscientific in the way they behave?

The answer, I suggest, has to do once again with the brain, this time specifically with the human brain. Like our heart, liver, or kidney, our brain too is a product of natural selection. However, its complexity far exceeds that of any other specialised tissue in the body. A distinguished neurobiologist has called the human brain the most complex structure in the entire universe. Because of its complexity, the capabilities of the brain far exceed the demands made on it during its evolutionary past. For example, human beings can use their brains to do higher mathematics. It is unlikely that this particular skill was of any use to our ape-like ancestors, but a complex brain, having evolved in response to other selective pressures, can also use rules devised by itself to manipulate symbols rather efficiently. With the help of our brains, we can carry out many so-called mental activities. These include introspection, analysis and imagination. Imagination can be a powerful tool when it is used in the quest to understand the world. It can also lead to the creation of purely 'inner worlds', mental constructs which satisfy our need to furnish an explanation for any unusual activity in the brain, but which may have no basis in reality. The invention of religious beliefs is an example.

Now we can see the kinds of problematic situations that our brain can get into. On the one hand, we are selected by evolution to understand objective reality and to come to terms with it: to understand that the world functions according to physical laws and to act accordingly. The attempt to comprehend reality forces the brain constantly to search for explanations of whatever it perceives as sensory impressions (or even imagines to be a sensory impression, as in dreams). In conflict with this desire to explain, the brain comes across many things for which an explanation either does not exist at the time, or exists but is too complicated to understand. This lands the brain in a dilemma.

There are seemingly mystifying occurrences which make a strong impression on the brain because, it seems, understanding them could be of vital importance to its very survival. As an example, consider a life-threatening event such as illness or serious injury, or the death of someone close. Such an event makes the brain think of how best it might ensure its own existence (perhaps, using inductive reasoning in the course of assessing the seriousness of the threat). But we can appreciate a potential threat to our existence without being able to work out a rational response to it – especially a response that offers an

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increased probability of overcoming the threat. The combination of genetic and neuronal memories is normally a sure guide to behaviour and a reliable check on misadventure. However, when we are confronted with a situation for which our evolutionary past has left us unprepared and our upbringing has not equipped us to analyse, our brain is in a quandary. The course of action which is natural to it – to work out the most probable hypothesis which describes the situation and, based on it, to act rationally – is not available.

I submit that we should not be surprised if, under such circumstances, the brain latches on to any hypothesis whatsoever. This is particularly so if the consequence of the hypothesis being wrong does not worsen a situation, meaning that it does not make one's own well-being less secure than it already is. If the hypothesis is shared by others, its plausibility gets strengthened. Consider prayer. If prayer, or any other similarly irrational exercise, can be consistently demonstrated to do harm to the person doing the praying, or if a rational alternative can be shown to work predictably, people will not adopt the irrational behaviour. A city dweller whose child suffers a cut may wash it and leave it at that. The same person, if his child is bitten by a snake in a jungle, may pray. In certain situations it is easy to convince ourselves that whereas doing nothing will not improve things, doing something just *might* help (especially if there is no way in which it can do harm). Superstition and irrational behaviour are not the prerogative of 'primitive' cultures; the popularity of astrological columns in the newspapers of the supposedly advanced Western countries testifies to this fact. Ironically, irrationality needs advanced brains. To put it differently, unscientific attitudes are possible only in human beings. Only they can get away with it.

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Science and the Spiritual Quest

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Basics for initiating dialogue between science and spirituality

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Three domains

According to Indian wisdom traditions, there are three knowledge domains: the material, the ethical and the spiritual. The material realm is the subject of physical sciences, the ethical realm that of moral science. And the spiritual is dealt with by the contemplative mind. The spiritual is not available for objective investigations. The spiritual can be experienced only by an individual reflecting mind.

Wisdom traditions of India identify three means of knowing the spiritual – scriptures, contemplation and deep personal experience. Spiritual knowledge gives an overall perspective of life, which neither moral nor material sciences can provide. Every individual, facing the mystery of life, has to have this spiritual perspective, which helps in relating the mind and material world in a holistic manner.

The genesis and the prognosis of the universe, the nature of consciousness and time-space are still a mystery. They might continue to be a mystery. But this would not mean that scientific investigations into these fields are fruitless. The individual human being has to understand himself/herself in relation to the known and the unknown and also the unknowable. Therein comes the role of spirituality. I do not believe that spirituality is one among many experiences. Spirituality is experiencing oneself in the context of the unknown and the unknowable. The so-called spiritual experiences are culturally conditioned projections of mind, an individual's response to his/her existential complexities. And this need will be there as long as human beings remain self-conscious and acutely aware of their limitations.

Initiating dialogue

The question of science and beyond, and the dialogue that might be possible between these two disciplines, has been agitating us. We have been trying to find some way of initiating a dialogue between the two domains.

I belong to a tradition where we face no problem about dialoguing with scientific traditions. We believe that science and whatever it deals with – the objective world – and spirituality – the subjective world – are two aspects of the same phenomenon. Hence, the dialogue between these two disciplines is believed to enhance the understanding the people who are involved with the respective disciplines.

Science is based on questions and doubt. If we understand spirituality as a matter of faith and to which absolute obedience is to be given, then there will be a problem to even initiate a dialogue. In the Indian tradition, to which I belong, such a problem is not encountered. Classical Indian wisdom traditions talk about two kinds of knowledge: a higher knowledge and a lower knowledge – $par\bar{a}vidya$ and $apar\bar{a}vidya$ or the $par\bar{a}prakrti$ or the $apar\bar{a}prakrti$. These two kinds of knowledge are considered to be two aspects of the same phenomenon.

A dialogue between science and spiritual traditions is very important. Science has advanced considerably and religion has stayed where it was 1000 years before. Hence, the imperative today is to take up this dialogue. How do we design this dialogue, its methodology, is the other important question.

Being just politically correct is not correct

There exists a pitfall which we have to review even before we initiate the dialogue. We tend to accept all kinds of ideas, traditions, or knowledge systems uncritically. As a result, we fail to analyse and distinguish between right and wrong knowledge.

We have to know that there is not only right knowledge, but also wrong knowledge. If a drunkard looks at the sky and says that there are two moons, I will not be able to accept his statement though I may respect the person, because, that statement would go against my understanding, experience and logical thinking. In this dialogue, we have to define the standards by which we judge right and wrong knowledge. Otherwise, we may fall into the quagmire of 'political

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correctness' – accepting everything uncritically. That might lead to a situation where knowledge does not advance.

We should have some way of critically judging traditions, knowledge systems and belief systems, so that a dialogue is possible. Otherwise, we will only be able to sit together and admire each other. Being just politically correct is not correct.

The impending danger before starting a dialogue is that we have not moved beyond the philosophy of 'political correctness'. Unless we are psychologicaly free from the weakness of 'getting offended', we will not be able to initiate a fruitful dialogue. I could be offended, when I listen to your presentation. It might shake me a little. But I can be steadfast in my tradition and belief system and still keep an open mind to explore common spiritual space.

The third reality of the 'unknown'

There are certain common spaces that we have created, where science and spirituality can come together. There is a private reality, a private space or private experience, which we may call the self or individuality or the conscious subject. We cannot negate the independent reality of the private world. There is also a public inter-subjective reality which science deals with. There is also a realm of the 'unknown', the 'beyond'. I will not include the 'beyond' in the subjective or the intersubjective world. Beyond is something totally beyond, and totally unknown.

The unknown will always remain unknown, though not in the way we understand the unknown. Science might encroach upon some aspects of the unknown. But still the unknown would continue to exist. In some way or other, we have to factor the third reality of the unknown as well into our dialogues and debates.

The three realities – the subjective, the objective and the ground reality of the unknown, whatever it may be, have to be accepted. We have to have different methodologies and approaches to understand these three realities. In the dialogue between these three realms of realities, our understanding about what is objective, what is subjective and what is the ground might change. However, the three realms will continue to exist and will have their own independent realms, and at the same time will continue to influence each other.

The question of human purpose and immortality

There are people who believe that the objective and the ground reality are projections of the subjective. This is one kind of reductionism. There are also people who believe that the ground reality manifests as the subjective and the objective. This is another kind of reductionism. We have to avoid these two pitfalls of reductionism and accept that the three realms are independent realms worthy of investigation.

Science and spirituality meet at points of acceptance. Spirituality respects the domain which science deals with. Science grudgingly accepts the domain of the spiritual. Both domains will have to accept a realm of the unknown which is challenging, teasing and intimidating us.

It is in this context that the question of human purpose comes – why do we conduct these investigations at all and worry about initiating a dialogue between domains dealing with different realms of realities? It is because, we all have a common desire, a common dream that we all share. Our dream is to be immortal. If we cannot be immortal, then there is no purpose or meaning in the investigation.

It is the drive for immortality that leads us to such investigations. By 'immortality' what we mean the immortality of the subject, the 'I'. We want to be immortal in terms of memory and not in terms of some vague idea. We want to be immortal so that we can experience ourselves continuously in a constantly changing world.

Can we experience ourselves continuously in a constantly changing world? If it is not possible, then our lives have no meaning. But something very deep in us says that it is possible. We all have an uncultivated desire for immortality. This desire is not the result of cultural processes. Each one of us choicelessly wants to be immortal.

The question of immortality brings scientists and spiritualists together. Religion talks about heaven, freedom, *moksa, samādhi* or the experience of beatitude. All these yearnings indicate the need for being immortal in terms of memory and not in terms of an idea. The question which challenges us is whether we can have a memory about ourselves which transcends all our objective memories. Scientists and spiritualists come together in a common space with that question.

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Another question, which brings scientists and spiritualists together, is how to have immortality in the present – right now and here – and not fifty years later or after death or at the end of creation. The limitations of technology arise at this juncture. Technology continuously postpones our need for immediate immortality. Whatever we gain through technology has a price. We see this fact in instances like that of progress versus environment. That which we gain through technology could create enormous comforts. But in the midst of comforts, we might continue to be inadequate and unhappy – comfortably unhappy though.

The question of how to be immortal right now needs a different kind of investigation. In the process of this investigation, technology will become redundant. Technology is certainly useful in many areas. However, it is not adequate for achieving the goal of immediate immortality which mankind has set forth.

Fundamental issues

Both scientific understanding and spiritual experience have a validity of their own. It is not to be mistaken that a person 'who has removed selfignorance' does not have to acquire the knowledge of the material world. By removing spiritual ignorance, we will not automatically gain knowledge of mathematics or physics or chemistry or the Chinese language. We have to make extra effort for specific kinds of knowledge. Mere spiritual understanding is not enough to live in this world. We also need an understanding of the world. Mere knowledge of the world also is not enough. We need an understanding of the spirit.

Spiritual understanding does not make us all-knowing. We can still be ignorant of many things. Buddha used to stand in front of homes begging, where nobody lived, thinking that people lived there. Buddha could not know that nobody lived in those homes. Ramana Maharshi did not know many events and facts about the material world. But he could solve the fundamental problem of loneliness, unhappiness and suffering. If we think that spiritual knowledge will give us all kind of information and knowledge, we are only fooling ourselves. At the same time, if we are interested in gaining only material knowledge and do not have spiritual knowledge, we are again fooling ourselves.

What is required is to solve our fundamental problems of unhappiness and insecurity by spiritual pursuit and also to try and gain

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material knowledge. It is because of this requirement of having to gain both material and spiritual knowledge as a co-process that in the *Bhagavad Gītā yoga* is defined in three ways. One definition of *yoga* is 'pursuit of excellence in the material world', whichever discipline we are engaged in – to try to gain perfection by study of the particular discipline. *Yoga* also means balancing our mind, reactions and responses to fluctuating situations. *Yoga* requires an ability to manage our reactions to situations. The third definition of *yoga* is that it is an ability to live in constant contact with our spirit, which is the source of everything.

Three levels of disciplines are necessary – material, mental and spiritual discipline. I would call it IQ, EQ and SQ. If we do not undertake all these simultaneously, we will be the poorer for it.

We need scientific pursuit. We also need certain ethical and moral discipline along with spiritual inquiry. Hence, we have to improve upon Ramana Maharshi. Let us not stop with Ramana Maharshi. We have to also improve upon Ramakrishna Paramahamsa and Jesus Christ. Let us not stop with them, though they were great souls. That is why we are here now and they appeared in those times. They have come and gone. It is for us to design our spirituality and that task is being taken up in the dialogues.

These are some of the fundamental questions that bring scientists together for a spiritual quest. We need to throw some light on these questions in the context of the dialogue between science and spirituality. We also need to look at Indian traditions that reflect on these issues and suggest solutions that have been studied, experimented with and proved in the personal lives of many people of yore.

The quest for ultimate reality

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Multiple faces of reality

Experience in the interpretation of many natural phenomena has shown that contrary to the adage 'seeing is believing', appearance can be very different from reality and reality itself can be at different levels depending on our perspective. Many a weary, thirsty traveller, trudging along a hot, arid desert, has been elated by the sight of a sheet of welcome water right in front of him reflecting the palm trees, only to be sorely disappointed at the realization that it is only a mirage and not reality. On a rainy evening, we have enjoyed the dazzling beauty of the multicoloured rainbow in front of us only to realise that the rainbow disappears when the sun behind us is covered by a cloud. In both these cases, we can convince ourselves that they are not tricks of our imagination by photographing the mirage as well as the rainbow. The photographs show the reflection of the palm tree and of the rainbow, the multicoloured arc stretching across the sky. In both cases, the physicist tells you that the reality is different from the appearance. In the case of the mirage, it is the effect of the refraction (bending) of the light reflected by the palm trees, in the intervening hot air in which the refractive index is changing with height due to a temperature gradient. Consequently, on the retina of the eye or on the camera film, the picture produced by the lens is similar to reflection in water. In the case of the rainbow, the display of colours along an arc is the combined effect of refraction, reflection and again refraction of light by those water droplets that happen to lie along the surface of a cone with its vertex at the eye and having a half angle of 22.5° . The position of the sun, which is the source of light for the droplets to reflect and refract, has necessarily to be low in the horizon behind us. Clearly, in both these cases, the objective reality, of what exactly is happening out there is very different from appearance. The deception, if we may call it so, is

not entirely in the human brain. It is only through proper analysis of the situation that the reality can be figured out. This may not be possible always. When we start analysing any phenomenon in nature scientifically, we find that there are various levels of reality depending on the level and purpose of explanation. A simple illustration will make this clear.

Suppose I take a stone and let it go from a certain height. The stone falls to the ground. Why? A school boy will say that the stone is a solid piece of matter and it falls down due to the gravitational force that operates between the earth and the stone, as first pointed out four hundred years ago by Newton. A chemist will say that the stone is composed of various compounds of elements like silicon, oxygen, iron etc., and it is the collection of all these molecules held together by the molecular forces, that is falling down. An atomic physicist will elaborate further and say that the molecules are made of atoms with nuclei at the centre and electrons orbiting around them. A nuclear physicist will say that the nuclei of all the elements are made of protons and neutrons, held together by nuclear forces. So in reality, the stone is a bunch of protons, neutrons and electrons that is falling down. A particle physicist will go one step further and say that the protons and neutrons themselves are made of quarks held together by quark-quark forces. So in reality, it is the entire system of quarks and leptons (electrons) falling down.

It is only at the gross level of observation that the falling of the stone can really be observed by the human eye. The explanations at all the deeper levels are based on the application of knowledge gained in different contexts, may be in different disciplines and at different times. While we would have stopped at the atomic level before the 1950s, by 2000 we are ready to go even deeper than quarks and electrons. This is because of the developments in the field of elementary particle physics on the one hand and the corresponding developments in theoretical physics and astronomy, on the other. In the falling stone phenomenon, clearly there are two aspects - one is the finer and finer material constituents and the other is the nature of the forces that operate at various levels. There is a third aspect which is generally not considered, but as we shall see, is the most important one. That is, the empty space in which the stone is falling and which also exists in between solid particles, in between molecules, in between atomic particles, in between nuclear particles and so on. It is an interesting fact that 99,99% of even a dense piece of iron is just empty space. For a long time in

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science it was thought that this empty space had no particular role to play except to serve as the non-interacting medium for matter particles to move around under the influence of forces. This is a totally wrong idea. It has now become clear that empty space plays an extremely important role both in defining the ultimate constituents of matter and the way in which the forces are mediated between the constituents. Newton introduced the idea of the gravitational force to explain why a stone falls down, why the moon goes round the earth or why the earth goes round the sun and so on. While he formulated the mathematical equations to explain these, he did not explain how this force originated and how it was transmitted across such large distances. This 'action at a distance' problem was somehow thought to be connected with the presence of the mysterious aether, a non-material medium that pervaded all space. A similar problem was also encountered in electricity and magnetism. Faraday introduced the idea of 'field', which helped in the mathematical formulation of the problem, not throwing any light on the nature of the aether which was again brought in to sustain the 'field'. Maxwell tried his best to explain the propagation of the electro-magnetic waves in terms of the elastic properties of the aether, but did not succeed.

The aether theory itself was discarded with the advent of the theory of relativity. Einstein replaced aether by the four-dimensional space-time continuum to explain the experimentally observed result that the velocity of light is independent of the motion of the observer or the source, in contradiction to the law of addition of velocities. In his general theory of relativity, Einstein dispensed with the idea of gravitational force and attributed the particular trajectory followed by objects like the earth to the curvature of the space-time continuum around massive objects like the sun. Einstein came to what was thought to be an intriguing conclusion that matter curved space and curved space itself was matter. Which is the reality? Matter or space?

The confinement of the electron to a specific orbit around the proton in the case of a hydrogen atom, is due to the electrostatic force between the positively charged proton and the negatively charged electron. The proton has a dimension less than 10^{-13} cm and the orbit of the electron is 10^{-8} cm. How does the electrical force act when the distance gap is quite large in terms of the dimensions of the proton? What is the physical mechanism?

The concept of force itself is an anthropomorphic concept that we become familiar with by experiencing the tension that we feel in the muscles when we lift a heavy weight or push a cart. The force is exerted only through contact. How does any force act when there is a gap however small the gap is? With the concept of aether discarded, this became an acute problem.

Einstein spent the last thirty years of his life trying to unify gravitation and electromagnetism, but did not succeed. Let us see what quantum mechanics has to say about electromagnetic interaction.

Vacuum and reality

According to quantum mechanics, all particles are considered to be quanta of corresponding fields - the photon is the quantum of an electromagnetic field, the electron is the quantum of an electron field, the proton of a proton field and so on. One of the important consequences of the field theory is that there is no space anywhere in the universe whatsoever, where there is no field. The question arises: What about vacuum? In vacuum also there are fields, but their energy is zero, which means they are fields without any real particles. If there is a field there must be oscillations which are impossible without particles. The way out of this dilemma is to introduce the idea of 'virtual particles' which appear and disappear. When an electron field oscillates, photons appear and disappear. When a meson field oscillates mesons appear and disappear. Does this mean that there is violation of energy conservation? This is where the famous uncertainty principle of Heisenberg comes to the rescue. As long as the particles appear and disappear within the time allowed by the uncertainty principle ($\Delta E \Delta t > t$ $\sim\hbar$), there is no violation. Accordingly, the more massive the particle that appears, the shorter is the time in which it has to disappear. Such transient particles are the virtual particles and they cannot be recorded directly with any instruments. Each particle has a cloud of virtual particles around it and in a sense this cloud travels along with the particle. When two particles interact, according to this theory, the virtual particles are exchanged. Thus the force of interaction is transmitted through the exchange of virtual particles. The creation of these virtual particles was attributed to the presence of quantum mechanical fields as the constituents of vacuum itself. Though these virtual particles cannot be recorded by instruments, their creation results in physical effects like the Lamb shift and the Casimir effect which are recorded and measured and give full support to the theory of

virtual particles, and the polarization of vacuum. Earlier to this quantum field theoretical approach. Dirac had been led to a different way of looking at the physical constitution of empty space or vacuum. This came about in Dirac's attempt to modify the quantum mechanical Schrodinger equation to the case of a fast-moving relativistic electron. The solution to this equation gave both positive and negative energy states to the electron. He did not ignore the negative energy states as unphysical. Instead he interpreted vacuum itself differently, by making the bold assumption that empty space or vacuum is not to be regarded as the absence of everything, but that which is filled with electrons in all the allowed negative energy states specified by his relativistic equation. While these negative energy states are not normally accessible, their existence becomes evident when there is a vacancy either due to spontaneous energy fluctuations or due to deposition of energy from outside. When this vacancy is created, out of the emptiness two entities turn up. One is a positive energy electron and the other, a 'hole' in the Dirac Sea, which is equivalent to a particle of positive charge and positive energy. This positively charged particle was discovered experimentally in cosmic ray experiments and had the same mass as the electron and was given the name "positron". Thus Dirac's theory was the first to predict the creation of particle-antiparticle pairs through materialization of quanta. It is now well-known that corresponding to every particle there is an anti-particle – antiprotons, antineutrons, anti- Λ° , etc., have all been discovered in cosmic ray and accelerator experiments. Thus in Dirac's formalism, vacuum is regarded not only as the reservoir of all electrons in all negative energy states, but also of all elementary particles in their allowed negative energy states.

From both the approaches, one thing is clear – that empty space or vacuum is not empty, but is a potentially rich medium, whose properties play a very significant role in the microworld of elementary particles and their interactions. Figures 1 and 2 illustrate how those grandiose ideas translate into happenings in the physical world of observation with sophisticated experiments. Figure 1 is an example of the creation of an electron–positron pair in an accelerator experiment. Figure 2 illustrates the complex modality of transformation of the energy of a single incoming high energy cosmic ray particle arriving from somewhere in the cosmos to that of more than a billion particles in the atmosphere of the earth – the creation, propagation and annihilation of a variety of particles all in less than a few tens of microseconds – through a series of cascade and spontaneous decay



Figure 1. Electron-positron pair production. A high-energy gamma ray coming in from above scatters off an atomic electron, losing some of its energy and producing an energetic recoil electron and an electron-positron pair. The electron and positron paths curve because the chamber is placed in a strong magnetic field. The direction of the curves reveals the signs of the particles' charges.



Figure 2. Development of a nuclear cum-electromagnetic-cascade in the atmosphere. The energy of a single cosmic ray particle of energy say 10^{17} eV is converted into those of a billion particles – electrons, gamma rays, pions, muons, neutrinos etc. All these particles in a sense were hidden in the vacuum as potential waves.

processes enabled by the hidden empty space.

potential properties of vacuum or

Big Bang and creation

According to the Big Bang theory of creation, what was first created in that glorious act was this expanding space or vacuum endowed with all the physical properties that have been figured out through experiments on the collisions of high energy particles and the formulation of the theories of relativity and quantum mechanics.

In the Big Bang Scenario, it is envisaged that time, space, laws of physics and values of natural constants were all created almost

simultaneously or in quick succession. As Dyson has pointed out, the Big Bang theory does not say anything about the Big Bang itself, about what exactly exploded and why. The beauty of the theory and perhaps the reason for its success is that the sequence of events after $\sim 10^{-43}$ s can all be worked out in sufficient and accurate detail. For this sequence to happen, it is necessary that the expanding space-time continuum or quantum vacuum be the repository of all the quantum fields corresponding to all the fundamental particles. The ambient temperature of the radiation at this juncture works out to a temperature of more than 10^{32} K (energy of the radiation is in excess of 10^{18} eV). The expansion results in the cooling of the universe and provides the necessary conditions for the creation of quark-gluon plasma at 10^{-6} seconds. One second after the bang, the neutron-protron ratio is frozen and nucleosynthesis starts at 180 seconds when the universe has cooled to 10⁹ K. Of course, in this whole exercise we are assuming the validity of the same laws of physics and the constants of nature from 10^{-43} s to 10^{17} s and over a temperature range of 10^{32} K to 10^{-3} K. Figure 3 portrays the possible time sequence of the physical parameters over the different epochs. Figure 4, taken from the book of Smoot and Davidson (1993), provides a graphic illustration of the physical, chemical and biological evolutions as a function of time and finally the emergence of the human, who is able to comprehend the whole sequence, thanks to developments in science and technology.

What is the significance and meaning of all this from the point of view of the quest for ultimate reality? For one thing, it is clear that the observed reality of the universe is a function of time and even the unobserved but deduced physical reality is a function of time. If the Big Bang theory is the correct theory of creation, (it is the most plausible one at the present time despite serious incomprehensible features at the beginning of space-time), then the physical universe came into existence at a finite time in the past ~10-15 billion years ago. However, the theory does not tell us how the space-time continuum or vacuum in the language of the quantum physicist, got all the properties it has to have in the first instance and how the laws of nature were defined. It is just a narration of the sequence of events that occurred with the constituents that emerged from space-time, subject to certain laws and governed by certain constants of nature. Emergence of life or consciousness was not an automatic consequence of these sequences. At least it has not been proved to be so yet. It has to be emphasized, however, that not all the properties of vacuum have been specified yet. Every time a new particle is discovered in accelerator experiments, the



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Figure 4. Big Bang to evolution of a pondering man – particle, chemical, biological evolutions – over a period of 10–15 billion years (from Smoot and Davidson 1993).

corresponding particle and the anti-particle field are accommodated in the vacuum. Thus properties of vacuum that specify life or consciousness will not become apparent until they are looked for in a specific way.

Vacuum and oneness

Vacuum as substratum highlights one important aspect of all creation – namely, 'oneness' or interconnectedness. In this sense, it removes the dichotomy of living and non-living, mind and matter. The present efforts of molecular biologists and neuro-scientists have been directed to explain both life and consciousness by chemical, electrical and physical processes. Clearly when one is dealing with consciousness, the category of experience, i.e., feelings, sensations, thoughts, is very different from the other kind of experience dealing with electrical signals, oscillations and chemicals that one becomes familiar with in the laboratory. One can establish only certain correlations. Such correlations may be of great value to psychologists or neurosurgeons in curing certain types of mental illnesses. The only way the gap can be bridged is by some kind of transcendence similar to what happened in physical sciences. Moving to a higher dimension – moving into a fourdimensional space-time continuum, Einstein recognised many new

identities which were not apparent till then. The equivalence of mass and energy, the dependence of the rate of flow of time and the length interval on the velocity of the moving frame, the increase in mass of a moving particle etc., are classic examples. Moving to still higher dimensions (10) the string theorists have shown a greater unification of gravity with other forces, Einstein's equations of general relativity with Maxwell's equation of electro-magnetism and so on. These developments in physical sciences have shown how the quest for ultimate reality is progressing with increasing trend towards unification at the end of extreme reductionism. From gross matter in three dimensions of space and time, one moved to molecules and atoms and fundamental particles, and finally to quarks and leptons. One began with gravitational force and then gradually the electromagnetic, the strong and weak forces with widely different ranges and strengths, were recognised. The chief domains of these forces are illustrated in figure 5 which is an adaptation from a figure by Glasshow, known as the Glasshow Snake, whose implication is the unification of the ultra-large and the ultra-small – the snake with its tail in its mouth.

While the general theory of relativity led to the recognition of the oneness of matter, gravity and space-time continuum, quantum mechanics highlighted the quantum vacuum (space) as the substratum of all particles and forces that define the activities of the universe. However, there is still no rigorous theoretical unification between relativity and quantum mechanics because of certain mathematical difficulties in quantizing gravity.

It is only through compulsion of experimental results and the consequent forced transcendences in the ways of thinking and modifications of the basic concepts themselves that the physical sciences made revolutionary advances. The connection between electricity and magnetism was first seen through the experiments of Oersted and Faraday. The formulation of the electro-magnetic theory by Maxwell is regarded as the first unification that was achieved. Our daily experiences with electricity and magnetism are distinctly different; yet the theory unifies them. Similarly, our perception of space, time, matter and energy are all different. Establishing a close-knit connection between these in Einstein's special and general theories is another example of the kind of transcendence that was necessary, which required the shedding of normal prejudices. The connection between vacuum and solid matter and the powerful forces of nature is yet another example of transcendence which we have stressed above.

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Figure 5. The constituents of the universe, their dimensions and the forces effective at the various levels as depicted by Glasshow. The tail of the snake entering the mouth signifies the unity behind the ultra-small and ultra-large.

Writing about the 10-dimensional String Theory which is yet another higher level transcendence, Michio Kaku says "Thus the main current dominating theoretical physics in the past decade has been the realization that fundamental laws of physics appear simpler in higher dimensions and that all laws of physics appear to be unified in ten dimensions. These theories allow us to reduce an enormous amount of information into a concise, elegant fashion that unites two great theories of twentieth century – quantum theory and the general theory of relativity. Perhaps, it is time to explore some of the many implications that ten dimensional theory has for the future of physics, and science, the debate between reductionism and holism in nature, and the aesthetic relation among physics, mathematics, religion and philosophy".

Upanisads and reality

In this context of unification and oneness that science in general and physics in particular is moving towards while dealing with the question of ultimate reality, it is relevant, particularly in this Seminar held in India on "Science and Beyond" to consider what some of the other

streams of knowledge, especially the ancient insights that have had their origin in this part of the world, have to say about this.

Schrodinger in his article "The I that is God" says:

"But immediate experiences in themselves, however various and disparate they be, are logically incapable of contradicting each other. So let us see whether we cannot draw the correct non-contradictory conclusion from the following two premises:

- (i) My body functions as a pure mechanism according to the laws of nature.
- (ii) Yet I know, by incontrovertible direct experiences that I am directing its motions, of which I foresee the effects, that may be fateful and all important, in which case I feel and take full responsibility for them.

The only possible inference from these two facts is, I think, that I – I in the widest meaning of the word, that is to say every conscious mind that has ever said or felt "I" – am the person, if any who controls the "motion of atoms" according to the laws of nature. Within a cultural milieu (kulturkries), where certain conceptions (which once had and still have a wider meaning amongst other peoples) have been limited and specialized, it is daring to give to this conclusion the simple wording that it requires. In Christian terminology to say: "Hence I am God Almighty" sounds both blasphemous and lunatic. But please disregard these connotations for the moment and consider whether the above inference is not the closest that a biologist can get to proving God and immortality at one stroke.

In itself, this insight is not new. The earliest records to my knowledge, date back to some 2500 years or more. From the early great Upanisads, the recognition $\overline{A}TMAN = BRAHMAN$ (the personal Self equals the Omnipresent, all-comprehending eternal Self) was in Indian thought considered, far from being blasphemous, to represent the quintessence of deep insight into happenings of the world. The striving of all the scholars of Vedanta was, after having learnt to pronounce with their lips, really to assimilate in their minds this grandest of all thoughts.

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Again, the mystics of many centuries, independently, yet in perfect harmony with one another (somewhat like the particles in an ideal gas) have described, each of them, the unique experience of his or her life in terms that can be condensed in the phrase DEUS FACTUS SUM (I have become God)".

The quintessence of Vedanta is in the four Mahāvākyas from four Upanisads which are as follows:

| Prajñānam Brahma | Consciousness is Brahman | Aitareya Upanisad Rg Veda |
|------------------|-----------------------------|---------------------------------------|
| Tat Tvam Asi | That Thou Art | Chandogya Upanisad Sama Veda |
| Ayam Ātma Brahma | This Self is Brahman | Mandukya Upanisad Atharva Veda |
| Aham Brahmāsmi | I am Brahman | Brihadaranyaka Upanisad Yajur Veda |

These four profound utterances reflect the philosophy of "oneness" of everything in the Universe – I, you, the body, the soul, the consciousness - and identify tat ONE with Brahman - the ultimate reality. To the question, why do we experience the multiplicity and not the oneness, the answer can be found, among others, in the Advaita philosophy of Sankaracarya (800 AD). According to Sankara, the problem has to be analysed from two distinctly different viewpoints. One is the transactional (vyavahārika) point of view and the other the transcendental (pāramārthika) point of view. The transactional point of view is the one that we are familiar with in our daily life and activities. From this point of view, the material world with which science is mostly concerned is real and one has to pursue every available way of finding solutions to every day problems. However, our experience tells that in addition to the waking state experience of the external world, we have two other experiences, the dreaming state and the deep sleep state which, from our memories of the realities of those states, show different aspects of our concepts of space, time, causality, etc. In the deep sleep state, even the concepts of space and time disappear. So reality appears different in different mental states of the same individual. According to Sankara, there are still higher mental states and the reality experienced in those states reveals the oneness behind all the multiplicity and, in that state, space, time, matter, etc., merge with the unchanging, eternal blissful state (Ananda) of sublime reality.

What is to be emphasized is that, in ordinary everyday life, multiplicity is the reality. It is not an illusion as wrongly conveyed by many. It is only for the person who has reached the higher mental state (the Jnani) that the world is unreal and the oneness, the Brahman, is the only reality. "Ekameva, Advayam Brahma, Neha Nanasti Kinchana" – there is only Brahman, the one without a second, there is no duality whatsoever.

Reality appearing different from different viewpoints is something that the scientist also has come to accept, particularly after the advent of the theory of relativity. In Quantum Mechanics also, the chameleonlike nature of reality becomes obvious from a reference to figure 6. This is purely a consequence of the formation of virtual particles that we discussed earlier and the possible states of these particles in extremely short intervals of time (say less than 10^{-21} seconds).



P = Proton, n = Neutron, \overline{P} = Anti-proton, \overline{n} = Anti-Neutron, Π^+ = Positive Π^- meson, Π = Negative Π^- meson, Π^- meson, Π^0 = Neutral Π^- meson

Figure 6. A proton moving from point A to B can be for a short time in any of these virtual states.

It is interesting that there is a very close similarity between these states of reality and what the Buddhist doctrine of Momentariness (Ksana bhanga vada) states (see Hiriyanna): "Nothing that is, lasts for longer than one instant". This is the cycle of origin and destruction. Reality is flux or flow; the notion of stability is illusory. No man can step into the same river twice. Even when some thing is not changing, it is not constant, but is reproducing itself – like a flame. Neither external reality nor the self lasts longer than an instant, but everything may continue as a series for any length of time.

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Einstein, who originally held the view "All knowledge of reality starts from experience and ends in it", changed later to the view "Experience remains, of course, the sole criterion of the physical reality of mathematical construction. But the creative principle resides in mathematics. In a certain sense, therefore, I hold it true that pure thought can grasp reality as the ancients dreamed". Erwin Schrodinger held the view "The world is a construct of our sensations, perceptions, memories. It is convenient to regard it as existing objectively on its own. But certainty does not become manifest by mere existence".

While the one substratum, the quantum vacuum, is behind all the inanimate part of the universe, the question arises whether it covers also the animate part, particularly life and consciousness, as was the case with the oriental insights. There are two slightly different ways of looking at this issue. One is to use the hierarchical argument. Though life and consciousness fall in the domain of biology, the efforts of the biologists is to find explanations for both these in terms of chemical and physical processes which means ultimately they are looking for explanations in chemistry and physics for anything that happens at the levels of molecules or atoms. For any subtle processes, the chemists look for explanations in terms of the physics of ultra-small entities atoms and elementary particles and strong, weak and electromagnetic forces. For some of the phenomena even in the inanimate world, the phenomenon of emergence, group behaviour of coherent constituents is becoming important. In this, properties emerge in group phenomena which are not there in the individual constituents. The exact mechanism of emergence is not clear. Life and consciousness may fall in this category. The second viewpoint is that the secrets of many of the physical phenomena in the universe are ultimately traced to the potential hidden properties of the vacuum. Every time a new fundamental particle is discovered in the laboratory, a new quantum field is added to the list of fields that constitutes vacuum. This is also the case when new forces are discovered. It may turn out the secret of life and consciousness may also be in some as yet undiscovered field of vacuum itself.

Summary

In summary, we can say that modern physics, guided by experimental methodologies and theoretical formulations based on advanced mathematics, on the one hand, and ancient philosophical insights drawn from an entirely different approach on the other, have come to very

similar conclusions on the nature of ultimate reality. Both identify an all-pervading substratum (urstoff) from which everything manifests by itself. However, for this to happen according to physics, the substratum has to be endowed with special types of quantum fields corresponding to the ultimate constituents of matter and forces and interactions between them and evolution in time should adhere to certain laws of nature constrained by the numerical values of certain constants of nature. While owing to the gigantic experimental efforts over the past several centuries and ingenious theoretical formulations, these constituents, laws and constants have been determined, one cannot say vet that the full potential nature of this substratum, the quantum vacuum has been exhaustively defined. It has been found that to come even to this stage of recognition of oneness behind certain aspects of the diversity, several transcendences had to be made in fundamental concepts like space, time, causality, matter, energy, field, etc. All this emphasizes the inherent tentative nature of scientific explanations and also provides for the possibility of linking what may appear disparate entities today to fall later into a common fold. Though pictuarisation or visualisation in higher dimensions is a serious limitation for the human mind probably connected with evolutionary aspects as pointed out by Max Delbruck, mathematical treatment in higher dimensions has definitely facilitated this unification and recognition of mathematics as an important guiding principle of nature. This unreasonable role of mathematics in physical sciences still remains a big puzzle as underscored by Wigner a long time back.

The ancient insights on reality are based on revelations to certain gifted individuals in their higher mental states. In these transcendental states, the barriers posed by the normal limitations of the mind are automatically absent and reality is perceived in its pristine character with all the multiplicity merging into one. It is claimed that such transcendental states can be achieved through disciplining the mind by practices like meditation, yoga, zen, etc.

I would like to end with a repetition of the quotation from Einstein:

"All knowledge of reality starts from experience and ends in it. Experience remains, of course, the sole criterion of physical reality of mathematical construction. But the creative principle resides in mathematics. In a certain sense, therefore, I hold it true that pure thought can grasp reality as ancients dreamed".

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Boundaries

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A material object has a boundary. This boundary exhibits the limit of the object. There is no extension of the object outside its boundary. A boundary marks the limit of a thing. It marks a difference between the object and that which is outside the object. So it creates a notion of difference.

It may seem that only when there is difference there is a boundary. A material object is different from the space around the object. But it is only the character of space – which is so different from matter – that allows us to see the object as such. The relation between boundaries and differences is intriguing. Is there a notion of boundary present whenever there is difference?

Consider binaries: where two terms stand in opposition. The two terms are indeed different, so different that they are opposites in some sense. How can we understand the meaning of opposition here? One simple way is to see the two terms as having *maximal contrast* – for example, man/woman, life/death, human/animal, god/human. In all these cases, is there some notion of boundary present?

Binaries do create a sense of boundary that allows us to claim that something is different from another. Being a binary means that these differences are in maximal contrast to each other. However, note that in the common examples of binaries, we do not have binaries whose members are completely different from each other. So when we say man/woman is a binary we, recognise a common world they also share. It is within a sphere of commonality that their differences are accentuated. Owing to this common sphere they inhabit, it sometimes becomes difficult to recognise boundaries between the terms of a binary. Where exactly would we draw a line between a man and

Boundaries

woman, animal and human? Similarly, when we talk of science/religion as a binary, as we sometimes do, then we are assuming that they also share a common space that makes comparison possible.

Something being different from another does not necessarily imply the existence of clear boundaries between them. Colours are different, yet they do not necessarily have clear boundaries between one another. The directions East and West are different, yet is there a boundary between them?

Another interesting kind of difference is the idea of limit. What is the relation between the limiting and the limited? When one tends to another is there a difference or are they the same? Is there a discernible boundary between two entities one of which is a limit of the other? So an interesting question is: what kind of differences makes us define and draw boundaries?

There is another analogy that is useful. The boundary of a solid ball is its surface. The boundary of the same ball, which is hollowed out, is still the same surface. The difference between these two cases is that the solid ball has a boundary, whereas the hollow ball *is* the boundary. A boundary has no boundary. That is, for something to have a boundary it has to have something that is bounded. Two consequences of this: there has to be an 'inside' which is bound and there exists a centre/core, which is contrasted with the periphery/boundary.

Boundaries play many roles. A boundary allows us to envision concepts such as inside and outside, limit, ownership, centre and periphery. It offers a criterion for contrast as well as identity, recognition of difference, defining an obstacle and so on.

Discourses have boundaries. These may not be as clearly defined as the boundary of an object but nevertheless we talk as if discourses and disciplines can be distinguished from one another very clearly. Discursive boundaries are actually not that difficult to discern. Most often, these reflect the authority of some members of that discursive community. The interesting question is whether discourses themselves recognise boundaries to their growth without agents who speak on their behalf.

Sundar Sarukkai

There are necessary preconditions for boundaries to exist. Generally, when we consider the issue of boundaries in a larger sense, we can ask the following questions:

- Who can build boundaries? To build boundaries a sense of ownership is required and ownership is most often granted by some agency. Boundaries whether of objects or discourses need an authority to designate them as such.
- Where do you build them? This is related to the above question.
- How do you build them? We can designate boundaries in various ways: by signs saying 'keep out', by fences or high walls. Without designating boundaries in some way we cannot recognise the existence of boundaries. How we designate them is central to what kinds of boundaries they are.
- Why do we have boundaries? This is a problematical question. Generally, when we want to build boundaries we expect that there is a reason for that such as establishment of territorial rights. This is true even in discourses. If somebody builds a boundary saying that this is what science is and that is what art is, then we can be sure there is something at stake which they think needs to be protected.

Identity

All objects have a boundary – the skin, sheath, form, shape. Boundaries give identities to objects. So boundaries make us believe that there is a notion of individuality, if not uniqueness. But recognising these boundaries is not an easy task. To have a boundary, you have to have something else to mark the boundary, as discussed earlier. Let me use the example of perception of boundaries and extend it to recognition of other kinds of boundaries such as discursive boundaries.

Take a triangle with black sides. Keep it against a black background. We do not see the triangle. The background makes the object invisible – this does not mean that the object has vanished but only that its boundaries are not perceivable. There is a common lesson we know well: if you want to see something properly, place it against a background that offers maximal contrast. So keep the black triangle

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against a white background to see the object most clearly. What the background is actually determines how we see an object, and thus how we see and recognise its boundaries. With changing backgrounds the object looks different even though 'nothing' about the object has changed.

Gestalt

How do we perceive forms, shapes and boundaries? Gestalt principles are very relevant in perception. Gestalt means 'whole' and the fundamental principle of Gestalt is the relation between the ground and figure in perceptual processes. Recognition of form/boundary is based on some principles that organise the field of vision, prominent among them being the figure-ground perception. Other principles, such as good continuation (tendency to see continuous forms in contrast to discontinuous ones), proximity (putting things together if they are closer), similarity (picking out patterns that have similar elements) and closure (tendency to form closed figures creating a sense of unity), also contribute to the way in which we see forms and boundaries.

The example of the figure that looks either like a vase or two faces is well-known. The Gestalt nature of perception is suggested by this example. Not only is the background important for perception but it also *modifies* what is seen.

Boundaries of science

Science has boundaries that are manifested in its discourse, practice, ideology and methodology.

1. These boundaries are not necessarily defined and marked by scientists. Often, scientists only respond to the dynamics of their disciplines and do not have much input into what they see as the boundaries of emerging ideas. Thus boundary formation in science is essentially *not internally driven*. In fact, science resists, as a methodological principle, any attempt to draw boundaries from within. This is also the reason why science resists incorporating 'external' factors like ethics into scientific activity. The only boundaries that are necessitated by the scientific spirit is that of methodology of theory and validation by experiments; use of multisemiotic systems, including mathematics, in its discourse; creating new

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technologies which extend the limits of observation and so on. But ideologically there is nothing that constrains the growth of scientific knowledge and the very idea of 'boundary of science' is quite in opposition to the spirit of science.

- 2. The most useful sense in which we can talk of boundaries of science is to ask how the boundaries of science are perceived at a given moment. Science may want to have an unfettered, infinite horizon but at any given moment there is some sense of a boundary beyond which science is not able to intervene, describe or articulate. Thus it is reasonable to believe that we may be able to see the boundary of science when viewed from 'outside' it. From the discussion given above, we can argue that the boundary of science is best seen against a background that affords maximal contrast to the foreground of science.
- 3. What is that which offers maximal contrast to science? Actually, there are different backgrounds that afford some contrast to science. Art is one such background. The importance of objectivity in science is often stressed in opposition to subjectivity in art. That is, the idea of objectivity in science gets maximally contrasted with the idea of subjectivity in the arts and because of this maximal contrast the boundaries of objectivity get clarified.
- 4. Among all such activities, it is religion that affords maximal contrast to science and thus functions as the most useful background against which the boundary of science can be seen. The reasons for this are many. Historically, science was in opposition to religion and theology. As a response, the methodology of science incorporated ideas that would stand in opposition to religion, such as the emphasis on objectivity, independence from divine will and intent, existence of autonomous nature defined by its laws and principles, and so on. Thus, to understand the boundaries of science, science must be placed against the background of religion. This contrast affords the clearest picture of the discursive boundaries of science.
- 5. We are therefore led to make this claim: *science and religion are in a Gestalt with each other*. They are in figure-ground relationship. One needs the other to bring forth its contours

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clearly. Religion and spirituality are not in opposition to science but in a Gestalt relation with it.

6. However, as we saw earlier, the Gestalt relation between figure and ground modifies our perception of the form/boundary. Thus religion as the background makes the boundaries of science clear. But because of the Gestalt relation there can be some ambiguity about the figures that are perceived.

Example

Quantification in science is in opposition to the idea of quality. This debate is well-known. What I want to point out here is just one manifestation of this quantity-quality tension, namely, the idea of infinity. Mathematics has quantified infinity. It has a grasp over infinity. Religion has the need for infinity as well, in its most qualitative sense. Almost all views of god talk about the infinity of god's presence.

The inability of science to incorporate quality, thereby continuing to privilege quantity, has serious consequences. Foremost of which is the inability to understand human existence in terms of quality and not in terms of quantity. A scientistic view of human existence talks in terms of how many years one could live rather than *how* (qualitatively) one lives. It is this inability to face up to human finitude (seen quantitatively by science) that partly drives the lack of ethical responsibility in science. Science desires the infinite for the finite humans without realising that its infinite is only quantitatively defined.

BUT...

Science has done its job in some sense. The boundaries of science are well-illuminated when placed against the background of religion. The finiteness of science arises in clear contrast against the infinity of religion and god. But the task is not yet done. The real task that lies ahead is not to talk of the boundary of science but of the boundary of religion and spirituality. Given that religion is defined almost always in terms of the infinite, the issue of boundaries in science poses this important question: *How do we recognise the boundary of the infinite?* This, in my view, is the most important challenge facing the science-spiritual quest.
Transforming 'the beyond' from enemy to ally: Methodological suggestions for the dialogue between science and the spiritual quest

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It's an intriguing title for a volume: "Science and Beyond: Cosmology, Consciousness and Technology in the Indic Traditions". On first hearing, it resonates as the ideal sort of topic for scientists and philosophers to explore together. After all, science continually strives for a knowledge of the world that is 'beyond' what is currently known. And 'the Beyond' has always been an important motif from a religious perspective. Religions have always been drawn to what is deeper, higher, or more Real than everyday appearances (*maya*). Can there be any question that the spiritual quest, in all its guises, pursues insight and understanding 'beyond' that of everyday realities?

At the same time, it's a perplexing title. One wants to know first of all: why this strange focus on 'the Beyond'? What is it, and why is it important? There are so many ways to relate Science and the Beyond. Which of the dozens of possibilities do the editors really intend as the book's title: The Tension between Science and the Beyond? The Impossibility of Separating Science and the Beyond? Science Pointing to the Beyond? Science Dependent on the Beyond? Science Trumped by the Beyond? Science in Service of the Beyond? Science Excluding the Beyond (there *is* no beyond for science)? Science Redefined in terms of the Beyond? The Beyond Beyond Science?

Many of the authors will stress the importance of the Beyond from a spiritual perspective and will offer their insights into its nature. Mine is a more humble task. I wish merely to ask, Why would 'the beyond' matter from a scientific perspective? What changed in 20th century science that would make this topic an appropriate one for a science-oriented symposium? The scientifically-minded person senses that there is an important question here. But the topic also raises red flags and calls out for caution: is it merely an excuse to smuggle religion in through the back door? How can the discussions be pursued in such a way that the strengths of science, and the intellectual prerequisites for doing good science, are not lost in the process?

With these concerns in mind, I propose five methodological parameters for any discussion of science and the beyond:

(1) Modern science originally defined itself by setting boundaries and excluding non-science, in order to bring all knowledge under its sway. Metaphysics and religion thus became its chief opponents. The record shows, however, that this attempt at boundary setting was fundamentally unsuccessful. Any serious dialogue must begin with a clear recounting of the limits that Science itself has encountered.

Boundaries draw us. Important things happen at the boundaries, and most of the significant questions are decided there. Already, the Greeks saw this: the limits or boundaries are what make the object beautiful; *they* make the argument rational. Nature abhors the infinite, *to apeiron*, because it is the boundaryless. Indeed, boundaries are constitutive of being. Perhaps, that's why there is such interest today in the boundary lands, where science and spirituality meet and overlap. We sense that we would really know what science is, what religion is, if we could only know how they are different, how the one limits the other.

For a while, of course, modern humans thought that science might be boundary-less. Such silly ideas still corrupt the pages of some of our science journals and help desperate authors sell copies of their books. But recent history teaches a rather different lesson. There was a time, of course, when Newton's laws seemed to reign supreme, when it was believed that all could be reduced to 'particles in motion', when the universe seemed to lack beginning or end, and when men of science believed that knowing the laws of nature would allow them eventually to reduce all events to states of physical matter and energy. But today that reductionist vision of the world is collapsing into rubble around us.

The collision of the individual sciences, with their various concrete limits, would require a talk of its own: relativity theory introduced the speed of light as the absolute limit for velocity, and thus as the temporal limit for communication and causation in the universe; Heisenberg's uncertainty principle placed mathematical limits on the knowability of both the location and momentum of a sub-atomic particle; the Copenhagen theorists came to the startling conclusion that quantum mechanical indeterminacy was not merely a temporary epistemic problem, but reflected an *inherent* indeterminacy of the physical world itself; so-called

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chaos theory showed that future states of complex systems (like weather systems) quickly become uncomputable, because of their sensitive dependence on initial conditions – a dependence so sensitive that a finite knower could *never* predict the evolution of the system, which is a staggering limitation, when one reflects on what percentage of natural systems exhibit chaotic behaviours; Kurt Gödel showed in a well-known proof that mathematics cannot be complete ... and the list goes on and on and on.

Emergence theory now suggests that nature is 'upwardly open'. The behaviour of a squirrel or monkey requires monkey-level explanations; one can only explain the hard work of a dancer or musician in terms of the standards of music and dance – not the standards of physics. If emergence theorists are right, the upwardly-open nature of human consciousness, characterised as it is by the progression from one idea to the next, offers a powerful example of a phenomenon *within* the natural world that points *beyond* the level of material or physical explanation alone (although any scientific theory of consciousness is still constrained by the limits of physics). And just as the neurophysiological structure of the higher primates is upwardly open to the emergence and causal power of the mental, so the mental or cultural world may be upwardly open to types of influence we can only call spiritual.¹

(2) No compartmentalised approach to knowledge can comprehend the limits of science and what lies beyond them. Disciplinary-bound methods cannot describe disciplinary boundaries. Instead, the task requires a mode of discourse that is both rigorous and, at the same time, not afraid to cast into question hegemonic claims to knowledge – be they religious or scientific. Our challenge is to find a synthetic vision that encompasses multiple fields of science as well as multiple religious traditions. How else could one address the two main topics of this book, cosmology and consciousness?

Interdisciplinarity – the task of working across disciplines – is a funny one. Scientists around the world are strongly discouraged from engaging in it. Yet, ironically, one can do it well only if one really is a master in at least one specific discipline. Unfortunately, interdisciplinary discussion is somewhat like a drug: most scientists eschew it, but those who become 'users', sometimes have difficulty regulating its use. The dosages become larger and larger; the heady generalisations over multiple disciplines give one the sense of floating comfortably over huge expanses of the cosmos; and soon the once-cautious scientist is making truth claims about Reality-as-a-Whole. Or, if I may change the metaphor, interdisciplinary discussion is like stepping into a cold river: many are afraid to get into the water at all. Those who do tend to jump in all at once ... and are sometimes carried away by the current.

The way to navigate the interdisciplinary river is to step in slowly, never losing contact with the shore of one's own home scientific discipline. One begins with a single pair of related disciplines, preferably related to one another (physics and biology), rather than closely scientifically distant (cosmology and consciousness). One should require that all participants in the discussion be experts in one of the disciplines and conversant with the other. Participants in the discussion must make only statements about their connections that experts from both disciplines will accept. Only when some agreement on these two disciplines has been achieved, it is safe to introduce a third discipline. One can then repeat the same careful process with this new discipline. Hence, one now needs experts from all three disciplines at the table, with each participant comprehending and respecting both of the other disciplines. Only through such a gradual process can one support statements about the unity of the various disciplines; to jump too quickly to 'the unity of all knowledge' is to run the risk of leaving science itself behind.

'All is information', the pundit proclaims. Well, perhaps; let's find out. We know something about physics and information, since leading physicists describe Quantum Theory in fundamentally information-based terms.² Do we know anything about the role of information in biology? 'Biological information' has been given a rigorous formulation in the new sub-discipline of 'systems biology'. In recent years systems biologists have given an information-theoretical formulation of the levels in life's "complexity pyramid".³ Construing cells as informational networks of genes and proteins, systems biologists distinguish four distinct levels: (1) the base functional organisation (genome, transcriptome, proteome and metabolome); (2) the metabolic pathways built up out of these components; (3) larger functional modules responsible for major cell functions; and (4) the large-scale organisation that arises from the nesting of the functional modules. Oltvai and Barabasi conclude that "[the] integration of different organisational levels increasingly forces us to view cellular functions as distributed among groups of heterogeneous components that all interact within large networks". Likewise, Milo et al have recently shown that a common set of "network motifs" occurs in complex networks in fields as diverse as biochemistry, neurobiology and ecology. As they note, "similar motifs were found in networks that perform information processing, even though they describe elements as

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different as biomolecules within a cell and synaptic connections between neurons in *Caenorhabditis elegans*".⁴

Now, what are the connections between the use of 'information' in these two fields? In order to find out, we need to convene a group of physicists, biologists and philosophers to explore the question (perhaps again at NIAS!). The process may seem laborious to those who seek quick answers. But if the 'science' in 'science and beyond' is not to be obscured, such careful consideration of what is already known will be an indispensable condition for progress.

In sum, one must learn to wait on the synthetic vision like one waits for the final note of a beautiful composition, or on the next dish in an excellent South Indian meal. If one introduces the synthetic vision too early, one brings the entire process to a screeching halt. Perhaps, what is needed is a Kama Sutra for interdisciplinary work. Yes, the synthetic vision brings great pleasure and is the final goal of the process; but it is most pleasurable, and most profound, when it is pursued with constant self-constraint and self-control.

(3) 'Science and the spiritual quest' is inherently self-involving. In this dialogue, the scientist cannot leave him – or herself aside, as he or she might when doing normal bench science. New habits of mind are required to explore the possible connections between science and spirituality, for here the self plays a role as an inner compass which is unfamiliar to most practising scientists.

For example, it is relevant that I am from the West. That I am male and a professor. That I earn enough money to own a car and a computer. That my father and mother were atheists and that I was brought up in a home without any religious training. That in my home religious belief was viewed with suspicion, whereas scientific thinking and progress were celebrated with excitement. Finally, it's relevant that I found my life meaningless in a purely physical world, a world without spirit; and that I found in Christianity a set of beliefs and spiritual practices that addressed this emptiness.

These are highly personal statements. If one speaks in this way at a conference on astrophysics or molecular genetics, one will only embarrass his audience. The auditors will rightly complain that one is being 'inappropriately personal'. And yet, if the theme of 'science and the spiritual quest' is intensely self-involving, as appears to be the case, then each speaker will have to include his or her story as well, if the reader is really to understand his or her position.

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(4) Progress in the new dialogue between science and spirituality requires a partnership between science and philosophy, for there is no 'theory' of science and religion that is not mediated through philosophy. Such a partnership remained underdeveloped in the West until recently, though it has long had a place in the Indic Traditions.

I will not say more in this essay about the philosophical theories that most successfully mediate between science and spirituality, since among the authors in this book are some of the world's foremost experts on this topic. Taken together their essays show, I believe, that a new partnership between science and spirituality, mediated through metaphysics, is possible. In fact, this new metaphysical quest may represent the most exciting intellectual project of the 21st century. Moreover, there is no escape from it, because science itself plunges us into metaphysical questions. The resulting insights will alter, if not rewrite, many of the great metaphysical systems of the past, those from the East and West.

A word of caution might be allowed: real partnerships exist only when the partners are genuinely equal. But past experience suggests that there is a serious danger that metaphysics will engage in an unintentional take-over of discussions on this topic. To scientists, such a move looks like a hostile take-over bid.

Yet there is a way for the other stakeholders, and for science, in particular, to prevent a take-over of the discussion by metaphysics. I submit my recommendation under the heading of 'the three quests'.

(a) *The scientific quest*. It is standard to speak of science as a quest. Research scientists know they are engaged in a never-ending task. Great scientists are the ones who continually turn their eyes beyond the well-tended gardens of successful theories; their attention inevitably fixates on the wild jungles of anomalous phenomena that confront current theories.

(b) The spiritual quest. In many places in the world, perhaps, even some places in India, readers might laugh when they encounter the phrase 'the spiritual quest'. (Indeed, in some places the response might be rather more hostile than laughter). And yet engaging in spiritual practices represents a quest that is equally as unending as the scientific quest. A famous passage in the Christian scriptures beautifully expresses the longing for what is not yet: 'Now we see in a glass darkly; then we shall see face to face. Now I understand in part, but then I shall understand fully, even as I have been fully understood' (1 Cor. 13:12). How deep a longing is expressed by the Jewish longing for the coming of the Messiah.

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Persecuted, spread across the world in the diaspora, Jews would say as they parted from friends, 'Next year in Jerusalem'! That beautiful phrase expresses the acute longing for the end of waiting, the end of the Jew's mystifying separation from his homeland, the end of longing for an age when God will no longer turn his back on the suffering of his people, will no longer be deaf to their cries, 'Next year in Jerusalem'! And how deep is the longing that the Sufi mystics express, the longing to know the mysteries of the divine, whose glory always exceeds whatever the mystic comprehends. I hear the same longing in the beautiful words that the mystic uses in the final book of the New Testament: 'And I saw a new heaven and a new earth; for the first heaven and the first earth passed away, and there is no longer any sea.... [God] shall wipe away every tear from their eyes; and there shall no longer be any death; there shall no longer be any mourning, or crying, or pain...' (Revel. 21:1, 4).

Spirituality lives for those in diaspora, for those who seek another kingdom. It lives for those who dwell 'behind the veil of tears', separated from ultimate reality by illusion, passion, selfishness and error. The Vedantic texts speak profoundly about the curtain of *maya*; I do not need to remind the readers of this book of their teachings. Spirituality too is a quest, no less than science.

(c) In the face of these first two quests, why is it then that many speak with such certainty when it comes to metaphysical answers? Metaphysics, according to one definition, is that conceptual structure which bridges the space between (present) scientific conclusions and the religious beliefs that accompany our spiritual practices. I need not remind you what a space it is between science and religion! Often, it appears to be a valley, indeed, a *chasm* between two worlds. If both science and religion are quests, and metaphysics is the attempt to build conceptual bridges between them, how can metaphysics be anything other than the most precarious of quests?

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My fourth point, then, is a plea for humility in metaphysics – for caution, for tentativeness. We *know* that science is in flux, that tomorrow's data may overturn today's theory. And religious differences suggest that certainty claims in this field are suspect as well. May our metaphysics be *no less* hypothetical than our science!

(5) What scientists can bring to this debate is a hard-mindedness often lacking in theology and inter-religious dialogue. Philosophers and religious scholars have important methodological lessons to learn from the way that scientists approach their work.

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I would like to conclude this short paper with apparent heresy: if we remove the tension between science and 'the beyond', we lose the driving force behind the discussion of these topics. This statement might seem heretical in a book which is dedicated to reducing the tension between science and spirituality. But reducing tensions and removing tensions are not the same.

One is familiar enough with meetings of religious leaders who plead for the modern world to forsake science and to return instead to religious truths and spiritual insights. 'Instead' is the key word here. Surely, the voices of our religious leaders are valuable as a corrective. But they do not express what a group of authors, who are scientists and philosophers, has uniquely to offer. Such a group has the capacity to build exciting new bridges, albeit tentative ones, between science and spirituality. And not just imaginary bridges. Because, many in the science-spirituality dialogue are experts in both the sciences and the spiritual traditions, books like the present one have the potential to develop sophisticated accounts of where the new bridges should be built, to propose precise architectural plans, if you will, of what conceptual structures can support them. In principle, these authors can help to resolve the hard conceptual issues of cosmology and consciousness – and the equally hard ethical issues raised by technology today.

But authors in this field face a monstrous danger. Often I fear that the odds are greater that we will succumb to the danger than that we will overcome it. It is the danger that one will 'reconcile' spirituality with pseudo-science, that is, with a watered-down version of science rather than with the actual results and methods of the empirical sciences. To reconcile spirituality with science, the way one *wishes* science were, is like dismissing an opponent based on weaknesses one wishes he had. Or, to use a gentler metaphor, it's like having a perfect relationship with a woman who exists not in reality but in one's imagination alone – as in the famous Greek myth of Pygmalion, who created a marble statue of a woman so beautiful that he fell in love with her.

Let there be a wedding of science and spirituality, but let it begin with real partners, with all their flaws and blemishes – but also with their real strengths. Readers of this volume know far better than I what are the strengths of the Indic traditions; and there are analogous strengths in the Western spiritual traditions as well. Let's keep the strengths of the sciences equally in mind:

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- * testable theories: the scientific community can eventually agree on what are the more and less successful theories;
- * *public data*: the experiments used to test theories can be replicated by any group of researchers in the field;
- * culture-independence: one's native language and culture neither exclude her from contributing to scientific progress nor give her special access to the truth;
- * *traceable causal histories*: science works because the causal histories for each of the phenomena it studies are accessible in principle to inter-subjective (communal) examination.

These four features describe the human activity that one is addressing when one accepts the challenge of 'science and beyond', and it's to this science that one must repeatedly return. May the participants in this fascinating dialogue be granted wisdom and intuition – but also precise empirical knowledge, crisp analysis, and theoretical acuity – as they seek understanding of reality with deep humility and reverence.

End Notes

- For examples of recent works on emergence theory, see Harold Morowitz, The emergence of everything: How the world became complex. (New York: Oxford University Press, 2002) and Niels Gregersen, ed., From complexity to life: On the emergence of life and meaning (New York: Oxford University Press, 2003). More popular presentations include John Holland, Emergence: From chaos to order (Cambridge, MA: Perseus, 1998); Roger Lewin, Complexity: Life at the edge of chaos (Chicago: University of Chicago Press, 1992); and Steven Johnson, Emergence: The connected lives of ants, brains, cities, and software (New York: Touchstone, 2001). By the present author, see The emergence of spirit, forthcoming (2004).
- See, for example, Anton Zeilinger, 'Why the quantum? It from bit? A
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 Archibald Wheeler and how they inspired a quantum experimentalist', in
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- 4. See R. Milo *et al* 2002 Network motifs: Simple building blocks of complex networks. *Science* 298:824-827.

Do Chimpanzees have souls? Possible precursors of religious behaviour in animals*

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Do animals have souls? Do chimpanzees show any sign of religious behaviour? These questions are seldom topics of discussion among scientists studying animal behaviour. Indeed, for the most part, they will deny the existence of "soul" and deem the subject of religion inappropriate for scientific debate. It was not my intention to become a scientist when, in 1960, I went to Africa to learn about wild chimpanzees. Thus, I went about my study in a different and unorthodox manner. Probably this is why, despite the fact that I acquired a doctoral degree in the end, I am not at all reluctant to explore the intangible concept of "soul" and the possible precursors of religious behaviour in chimpanzees and other animals.

I arrived in Gombe with no scientific training. I watched the chimpanzees with a mind unbiased by reductionist scientific theory. I was not afraid to let intuition play a part in my gradually evolving ability to interpret the complexities of chimpanzee society and behaviour. Knowledge gained from the Gombe study, now in its forty-third year, and information from other studies of the great apes, has helped us to redefine our own place in the animal kingdom. These studies demonstrate, on scientific as well as intuitive grounds, that we humans are not, as was once believed, the only living beings with personalities, minds capable of rational thought, and emotions similar to – and sometimes perhaps identical to – those that we call happiness, sadness, fear, anger, and so on. The great apes have brains more like ours than that of any other living creature. They demonstrate the ability to make as well as use tools. They are capable of intellectual performances that we once thought unique to ourselves, such as

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recognition of self, abstraction and generalisation, cross-modal transfer of information, and theory of mind. They have a sense of humour. Chimpanzees form affectionate and supportive bonds between individuals, especially family members, which can last throughout a life of up to sixty years. They show compassion and true altruism. Sadly, all too much like us, they also have a dark side and are capable of extreme brutality. They are aggressively territorial and may attack "strangers" from neighbouring social groups, leaving them to die of their wounds. They may even wage a kind of primitive warfare.

Clearly, the line dividing humans from the rest of the animal kingdom, once thought so sharp, has become extremely blurred. Perhaps, after all, it is not so ridiculous to speculate as to whether chimpanzees might show precursors of religious behaviour. In fact, it seems quite possible that they do.

In one of the remote, steep-sided valleys in Gombe, there is a glorious, hidden waterfall. As one approaches, moving quietly through the forest, the roar of the falls gradually gets louder. Suddenly, through the vegetation, one glimpses the living, moving water as it cascades down from the stream bed some eighty feet above. Over time, the water has worn a perpendicular channel in the rock. Vines hang down on either side, and ferns move ceaselessly in the wind created by the falling water. For me, it is a magical, spiritual place. And sometimes it seems that the chimpanzees too are strangely moved. As they approach, their hair may bristle, a sign of excitement. And then they may start to display, charging with a slow, rhythmic motion, often in an upright position, splashing in the shallow water at the foot of the falls. They pick up and throw great rocks. They leap to seize the hanging vines and swing out over the stream in the spray-drenched wind. For ten minutes or more, they may perform this magnificent "dance". Usually it is the males who display thus, but I have seen females react in the same way.

It is not only a waterfall that stimulates such performances. Quite often, the chimpanzees display thus when they cross a stream, charging rhythmically up and down, stamping through the shallow, racing water, picking up and throwing rock after rock. And even more often, we see the "rain dance" that takes place at the sudden onset of a heavy downpour. Strangely, the most incredible "dance" of this sort ever observed at Gombe occurred right at the start of my study. I had a grandstand view of no fewer than seven adult males displaying on the other side of a narrow, steep-sided valley opposite me. Each of them

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charged down, dragging huge branches, leaping up to sway vegetation, while the thunder growled and crashed, rain teemed down from purple black clouds, and a group of females and youngsters watched from trees on the skyline. Every performer charged down at least twice, some more often, pausing briefly in trees at the bottom of the slope before plodding up, then starting their magnificent dance all over again.

What triggers these marvellous performances? Is it possible that the chimpanzees have a sense of awe, a feeling generated by the elements – rain, thunder, falling water – or even, as I witnessed once, the sudden onset of a fierce wind that raced up the valley from the lake? Certainly, all these things generate intense feelings of awe and wonder and excitement in me.

After a waterfall dance, a chimpanzee may sit on a rock in the stream gazing up at the sheet of falling water, water that seems alive, always rushing past yet never going, always there yet ever different. Was it perhaps similar feelings of awe, or wonder, that gave rise to the first animistic religions, the worship of the elements and the mysteries of nature over which there was no control? Only when our prehistoric ancestors developed a spoken language would it have been possible to discuss such internal feelings – discussions that could create a shared belief system.

My years spent in the forests of Gombe crystallized my own spiritual awareness. Day after day I was alone, sharing the wilderness with the animals and the trees, the gurgling streams, the mountains, the awesome storms, and the star-studded night skies. I became one with a world in which, apart from the change from day to night, from wet to dry season, time was not important. I became ever-more attuned to the great Spiritual Power that I felt around me, the Power that is worshipped as God, Allah, Tao, Brahma, the Great Spirit, the Creator, and so on. I came to believe that all living things possess a spark of that Spiritual Power. We humans, with our uniquely sophisticated minds and our spoken language, call this spark, in ourselves, a "soul". If this is so – and it cannot be proved either way – then it follows that chimpanzees and other animal beings have souls also. Certainly, we cannot prove that they do not.

As most scientists do not admit the possibility of a soul in humans, a study of the animal soul is hardly a subject for scientific investigation! But religious behaviour in humans is a fact. A study that

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compared religious rituals across a variety of human cultures, searching for elements shared by most (or all) such rituals, would be scientifically respectable. And, in this context, we could ask whether chimpanzees (or other animals with complex brains and behaviour) might show precursors to human ritualistic behaviours.

Careful documentation of the contexts and behaviours involved in the elemental displays of chimpanzees would be extremely interesting. Our videography records of waterfall, stream-bed, and rain displays would provide valuable information because they allow detailed analysis of movement patterns and social interactions. And these filmed sequences are typically accompanied by field notes that describe behaviours leading up to and following the displays.

Such investigations might throw new light on the emotions that trigger the displays and whether they sometimes resemble those that we describe as awe and wonder.

It seems most unlikely that animals other than ourselves are aware of their souls or are concerned about the existence of God. They are concerned with going about their lives, finding food and shelter, propagating their species. But most of them are probably far more in tune with their spiritual selves than we are, more aware of the great Spiritual Power in which we all "live and move and have our being".

It is important that science dares to ask questions outside the prison of the biased mind, dares to explore new areas of animal being. Such explorations might not only increase our understanding of and respect for other-than-human mental states, but also illuminate aspects of our own spiritual development.

Quantum physics points to a spiritual universe

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Introduction

Science, which once tried to eliminate the notion of God, is now offering support for humankind's belief in a supreme power. However, it was the deterministic classical physics that was in contradiction to spirituality. New revelations from modern cosmology and quantum physics are helping to foster a paradigm shift, which is ushering in a convergence of our scientific and spiritual quests.

The essence of special relativity and quantum mechanics, which revolutionized our perception of reality, are established today beyond any reasonable doubt. The marriage of these twin pillars of modern physics has given us the highly successful quantum field theory. Despite its rocky history since the 1930s, the results of rigorous testing of the predictions of quantum field theory presently provide the bedrock for constructing the well-known standard model of particle physics, thereby giving validity to its basic insights. One of the most significant features of the quantum field theory is its unique ability to explain a very mysterious aspect of nature that fundamental particles, like electrons, are absolutely identical everywhere in the universe, no matter when or where they are created. This is because, as Frank Wilczek (1999a) explains, "In quantum field theory, the primary elements of reality are not individual particles, but underlying fields. Thus, for example, all electrons are but excitations of an underlying field, naturally called the electron field, which fills all space and time". So, every particle of the standard model represents the excitation of a corresponding quantum field.

Modern physics and cosmology are leading us to the inference that all these fields arise from one common source, from which creation

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itself sprang. And what's more – the common source should still be present and active all through the universe, just as God of religion did not create the world and leave it. However, it may not be readily obvious that the unification of fields evidencing the common source can be present at ordinary temperatures. The following arguments elaborate in some details our understanding of the common source and suggest that unification is still viable today in a quantum physical way.

The quantum physical feasibility of unification

The underlying fields of the particles in the standard model are classified as matter fields and force fields. The matter fields package energy to produce the building blocks of matter, the fermions. The force fields, through their carrier particles, the bosons, govern the interactions of matter, producing the basis for physical reality.

All these primary fields are present in all space at all times throughout the universe, even in vacuum. Furthermore, the fields must always be fluctuating in conformity with Heisenberg's uncertainty principle. Presence of vacuum fluctuations of the electromagnetic field is well-documented by observation of a variety of phenomena, such as the Lamb shift and the Casimir effect. However, these vacuum fields are subject to some specific organization at fundamental distance scales. In fact, Wilczek (1999b) asserts, "According to modern quantum physics, the vacuum, which evolution has selected us to regard as an empty background, is in reality a highly structured, responsive and dynamic medium". This structuring of the vacuum can best be understood in terms of nature's symmetry principle.

As Greene (1999, p. 374) observes, "One overarching lesson we have learned in the last fifty years is that all forces are associated with nature's symmetry principles". Forces exhibit their separate identity when nature's symmetry is spontaneously broken. For example, the electromagnetic and the weak nuclear force show their disparate properties at ordinary distances, since the electro-weak symmetry is broken. However, Georgi (1989, p. 436) maintains, "If you do an experiment that probes the structure of the world at distances much smaller than 10^{-16} cm, you will see SU (2) × U (1) as an explicit (though approximate) symmetry".

For the strong force, Wilczek (1999b) proffers, "When we calculate where the unification takes place, we find a truly remarkable

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result. The strong, electromagnetic and weak couplings, which are significantly different when measured at 'practical' distances, are calculated to become equal when measured at distances about 17 orders of magnitude smaller—near the Planck unit of distance". The unification of strong, weak and electromagnetic forces is believed to occur when the SUSY GUT symmetry is restored at about 10^{-30} cm, additionally, uniting all the fermions as members of one family.

This process can be understood more graphically as a further consequence of Heisenberg's uncertainty principle. When the vacuum fluctuations get large enough, they can create transient pairs of particle and anti-particle of the various fields. Along with the particle creation and annihilation, the wild fluctuations of the electromagnetic, weak and strong fields, create quantum frenzy on the microscopic scales. Because of the uncertainty principle, this frenzied behavior gets increasingly energetic on ever-smaller distance and time scales. The renormalizable quantum field theories carefully take these effects of the high energy quantum frenzy into account to calculate the coupling strength of the various fields as a function of distance and to show that the symmetries are restored gradually at fundamentally short distances of the vacuum, even though they are broken at practical distances.

Wilczek (1999b) contends further that, "From its much inferior strength at accessible energies, gravity ascends to equality with the other interactions at roughly the Planck scale. Thus, we discover that all the coupling strengths become equal simultaneously. Even in the absence of a detailed theory, we find here a concrete, semi-quantitative indication that all of the basic forces arise from a common source". This also provides a compelling argument to suggest that the Planck length derived from three natural constants may well correspond to physical reality.

Manifestation of one more symmetry of the laws of nature, known as super-symmetry, is indicated, albeit, yet circumstantially. Super-symmetry is surmised to facilitate unification of bosons and fermions at the Planck scale, where all the fields behave as just different aspects of one field, the super-unified field or the unified field, in short. Although we still lack a mathematically consistent formulation of the unified field, its existence is widely anticipated. All the various types of energy observed in the universe turn out to be merely different forms of only one substance. Therefore, it is most likely that the fields governing the manifestation of energy will eventually be shown to be coming from one universal source.

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Unification of the electromagnetic and the weak nuclear fields has been demonstrated conclusively by probing distances near 10^{-16} cm. Recent observation of the neutrino oscillations lends strong support to the GUTs, which represent the unification of the strong nuclear field with the electro-weak field, as well as unification of the quarks and the lepton fields. Gravity is the only force field, which has so far eluded our attempts to unify it with the other force fields, though progress in string/M theory appears to be quite promising in proving the unification of all the fields of nature. It would be fair to say that most physicists would agree with the words of Steven Weinberg, "If history is any guide at all, it seems to me to suggest that there is a final theory". Therefore, we are not likely to be amiss in placing our confidence in the reality of the unified field, the common source.

All of nature's symmetries are thought to have been manifest at the very high temperature characteristic of the onset of the universe. As the temperature of the universe dropped by expansion, spontaneous symmetry breaking occurred sequentially and all the four forces of nature as well as all the fermions acquired their separate attributes. However, can we still have unification of the vacuum quantum fields today in the absence of the high temperatures?

In quantum field theory, physics at fundamentally small distances is said to be comparable to physics at high temperatures. Therefore, the physical conditions at fundamentally small distances should be similar, in a quantum physical sense, to those near the beginning of the universe. Our earlier discussion, in fact, illustrates that as we proceed to small distances toward the fabric of space (Greene 1999, pp. 357-358) near Planck's length, all the symmetries are expected to be gradually restored in steps along with the associated unification, just as progressive unification is believed to have been manifest at higher and higher temperatures in the very early stages of the universe. Of course, we have no direct verification of these in our laboratories. But we can believe in them, because they are consistent with theories that have been proven to be true. Moreover, study of the early universe in nature's cosmic laboratory may afford us an opportunity to strengthen our belief.

Thus, at or near the very fabric of space, the Planck length, all the underlying, fluctuating quantum fields of nature are surmised to be unified today in a virtual quantum physical way, even in the absence of the high temperature typical of the beginning of the universe. Although "virtual", the existence of the common source near the Planck length would be no less real than the virtual screening charges, whose effects are well-documented.

A cosmic awareness

As discussed above, a solid scientific foundation supports the basic insight of quantum field theory that the primary elements of reality are the underlying fields, which permeate all space and time. There are good reasons to believe that all these fields come from a common source. Credible arguments also indicate that the common source which, having spawned the universe, is now present at the fabric of space throughout the universe, thereby governing the foundational aspects of at least everything physical. This source brings us amazingly close to the concept of immanence in Western theology and Brahman in the Indic tradition. What is lacking is some concrete evidence of a feature of awareness attributable to the source.

At a first glance, the phenomenon of awareness or consciousness looks utterly incompatible with our general scientific view of the world. However, when examined in the light of the bizarre discoveries of the fundamental quantum nature of the universe, consciousness is not unlike the primary reality of the quantum fields and, therefore, they could be related. A scientific description of nature cannot be concluded until it reveals that relationship. In the words of Roger Penrose (1994, p. 8), "A scientific world-view, which does not profoundly come to terms with the problem of conscious minds, can have no serious pretension of completeness. Consciousness is part of our universe, so any physical theory, which makes no proper place for it, falls fundamentally short of providing a genuine description of the world".

It would be hard to deny that consciousness, the very window through which we eventually gather our prized scientific knowledge, is an integral part of the universal reality. As Eugene Wigner (1983, pp. 173-174) puts it eloquently, "The principal argument is that thought process and consciousness are the primary concepts, that our knowledge of the external world is the content of our consciousness and that the consciousness, therefore, cannot be denied". Wigner maintains further (1983, p. 169), "... it will remain remarkable, in whatever way our future concepts may develop, that the very study of the external world led to the conclusion that the content of consciousness is an ultimate reality". Penrose (1989, p. 448) adds by contending that, "It is only the phenomenon of consciousness that can conjure a putative 'theoretical' universe into actual existence"!

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If the ultimate reality is the content of our consciousness, which, in turn, is a reality of our universe, there ought to be a link between these two realities. Such a link appears possible from an examination of the extraordinary quantum properties of the universe. Penrose (1994, p. 420) proclaims, "I believe that there is already an indication, within the mysterious developments of quantum mechanics, that the concepts of mentality are a little closer to our understandings of the physical universe than they have been before - although only a *little* closer. I would argue that, when the necessary new physical developments come to light, these indications should become good deal clearer than that". Penrose and his colleagues have also proposed (Penrose 1994, p. 408) a possible physical mechanism, "... cytoskeletons contain microtubules that are capable of sustaining the quantum-coherent states that I am suggesting are, at root, necessary for our own awareness". Although the investigation of their suggestions is still in a rudimentary stage, it is encouraging that several groups in the world are currently engaged in it.

However, even without addressing the details of the structure of complex neurons and their activities, an overall framework can be envisioned, which will eventually explain how awareness can be associated with apparently inanimate fields. Such a framework emerges from the basic concepts of quantum mechanics. The necessity for embracing a simultaneous existence of complementary properties to explain the quantum world paves the way for contemporary scientists to find an essential link between seemingly irreconcilable mind and matter.

The properties of the quantum world led the pioneering physicist, David Bohm, to propose an "implicate order" where mind and matter are indivisible. From this viewpoint (Hiley 2000), the irreducible primary realities of field and awareness are inseparable aspects of the same elementary process united through mutual participation. The biological nervous system then provides a material structure for unfolding consciousness in each individual from potentiality of awareness to a manifest reality. As Penrose argues, new developments in quantum physics are necessary to make the particulars clearer. There is an air of expectancy that quantum mechanics will be reformulated in a manner that time and space are not ordinary numbers, but possess the characteristics of quantum superposition. In this new representation, the unbounded potentiality of awareness is likely to emerge as an innate feature of the universe similar to that of the primordial quantum fields.

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Therefore, plausible arguments can be made to suggest that the common source is associated with an inherent characteristic of awareness, thereby giving some credence to the concept of a cosmic spirit. Although the scientific community at large may not support such a concept now, it has been the firm underpinning of our spiritual pursuit through the millennia. However, with further progress in our understanding of the place of consciousness in nature, it is conceivable that scientists will be able to accept the existence of the potentiality of a cosmic awareness, as has been the gradual recognition of the closely related weak anthropic principle, which appeared repellent to many.

Anthropic principle

The emergence of consciousness as a natural consequence of the unique features of our universe has become a topic of much discussion, known as the anthropic cosmological principle. This principle proposes that the physical constants of nature are precisely tailored in this universe for unfolding of consciousness; otherwise, intelligent beings like us would not have emerged to ask the question: Why are the natural laws and their constants so accurate? Stephen Hawking maintains (2001, p. 87), "Many scientists dislike the anthropic principle because it seems rather vague and does not appear to have much predictive power. But the anthropic principle can be given a precise formulation and seems to be essential when dealing with the origin of the universe". Therefore, he remarks (Hawking 2001, p. 86), "... few people would quarrel with the utility of some weak anthropic arguments".

The anthropic principle offers a unique solution for the particular way our universe began. At its inception, the entire universe was much smaller than an atom and, therefore, subject to the principles of quantum physics. Quantum mechanically, it could have begun in numerous possible ways. Hawking suggests that the anthropic principle can be implored, requiring that the evolution of intelligent life be a necessary condition for the beginning of our universe. Wheeler (1996, p. 44) is more emphatic in stating, "Quantum mechanics has led us to take seriously and explore... that the observer is as essential to the creation of the universe as the universe is to the creation of the observer".

Thus, some eminent physicists are now inclined to believe that the emergence of consciousness has been a requisite of our universe at its very beginning. If the physicists are capable of accepting this, they are

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capable of addressing the potentiality of consciousness from a cosmic perspective. In the event that awareness is an inseparable aspect of the all-pervading quantum fields or their unified common source, it should permeate through all space and time in the universe. Some preliminary observations (Grinberg-Zylberbaum *et al.* 1994) of the nonlocal aspect of consciousness hint at this possibility. Studies of nonlocality of consciousness are gaining a foothold in some research laboratories. Notably, Brian Josephson of Cambridge University and his collaborators seem to be of the opinion that such phenomena will be eventually accepted by science and confirmed by it (Josephson and Pallikari-Viras 1991).

The spiritual implications of nonlocality of consciousness are profound, as it cannot be confined within an individual brain and segregated from all other minds. Interconnection of individual minds at some level could point to their common feature of being linked to the unbounded potentiality of cosmic awareness, making ours a spiritual universe.

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The power of faith in science and spirituality

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The brain is currently being characterized as the last frontier of research endeavours in science. It is certainly the most complex of biological questions still outstanding. Its primary function seems to be that of *cognition* – the umbrella function that embraces attention, perception, and memory. Our knowledge of what constitutes memory, for example, is still fairly elementary.

We know from the research work of pioneers in the neuroscience of the brain in the 1960s and 1970s that changes in synaptic function underlie learning and memory. The well-known neuro-transmitter, acetycholine, is essential for the rapid firing of neurons. And if there is a deficit of acetycholine, for instance, through the accumulation of its enzyme inhibitor, acetycholinesterase, there follows a breakdown in learning and memory, as it is evident in degenerative neurological diseases, such as Alzheimer's disease. However, attempts to enhance learning and memory by the few currently approved drugs based on acetylcholinesterase inhibitors do not result in a sustained condition of memory enhancement. A more promising approach seems to be to go directly to the memory coordination centre of the brain - the hippocampus - and increase its level of a second messenger cyclic AMP, which carries signals from the surface membrane of a neurone to the proteins within the cytoplasm inside the same neurone. The messenger cyclic AMP is known to be broken down by the intrinsically located enzyme phosphocliesterase. By inhibiting this enzyme, the level of cyclic AMP is boosted significantly - and so is memory in the brain of experimental rodents used in these experiments (Russo 2002).

^{*} It is with deep regret and shock that we learnt about the sad demise of Prof. Odhiambo on 26 May, 2003.

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Yet, memory alone – even when kept at its optimum using drugs, as biosciences research seeks to do – is not an adequate condition for cognitive stimulation and the promotion of a sense of purpose in a community or society. For this to happen, there needs to be a strong sense of connectedness in that community or society.

In a singularly revealing study of the very elderly in the central district of Kungsholmen within the city of Stockholm, Sweden, a recent study has clearly demonstrated that community connectedness – comprising a rich network of social interactions and community commitments with children, relatives, friends, and other members of the community – provides a sense of purpose and cognitive stimulation to the elderly. This community connectedness helps to protect the elderly from depression, dementia, and Alzheimer's disease (Emmett 2001). These social relationships need to be deep and satisfying – and not merely numerous or frequent – for this cognitive stimulation to be effectively manifested.

The evidence supporting this conclusion comes from a landmark paper published in April 2000 by Laura Fratiglioni of the Karolinska Institutet in Stockholm, who interviewed 1,203 elderly persons over a period of three years. All of them had good cognitive capabilities at the start of the research. The results are definitive (Fratiglioni, 2000).

- Living alone was less risky than being alone;
- Those having strong social networks had less risk of developing dementia;
- A poor or limited social network increased the risk of dementia by 60%;
- Satisfactory social relationships with children, relatives and friends were important to cognitive stimulation than merely frequency of contact; and
- Risks for cognitive decline are higher among those having unsatisfactory contact with children than those having no children at all.

The vital understanding we derive from this study is the crucial importance of community connectedness, of social interactions, and of being embedded in social interactions and social networks in a rich, interactive manner. *Social engagement* of a quality, rich character mobilizes cognitive capacities, leading to a sense of purpose and fulfillment; and a *rich social environment* is important for maintaining a proper psychological balance (Berkman 2000).

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It is these two dimensions of social connectedness and integration that characterize the African social context in its indigenous nature. They have given the perception of Africa's deep and enlarged social space; and may, indeed, explain the astonishing resilience of the African society in the face of horrendous pressures of the last millenium or so – that include the African slave trade for nearly 700 years, colonial subjugation for another 300 years, and long episodes of multi-year droughts and disease epidemics and famine over the last two centuries or so. Community connectedness, and the firmly established and explicit *spiritual connectedness* of the family and the community to God, runs through all relations, including relations to nature, and gives added value and vitality to *the individual effort* in the quest for wisdom and knowledge.

The African society is very much embedded in an integral complex of communities. It is a society of an inter-connected communion of communities, rather than merely a collection of individuals. But each and every individual is very much respected; each feels a sense of selfworth and self-dignity, because each individual expects that the singularity of talents and skills and respect he/she brings to the community basket of gifts will be acknowledged, and, therefore, confirms his/her uniqueness to the community as a whole. Sharing then becomes a matter of normal and expected social obligation in day-today community interactions. Each individual has his physical and material qualities - his/her body, and all the attributes (including heart and brain) that go with this physical entity; but in addition, he/she possesses a living force, which is in dynamic symbiotic association with his/her physical entity (Masolo 1995). In Africa's philosophical view, it is this living force that gives the human person his/her human essence - ubuntu (among the Bantu) or dhano (among the Nilotes). The living individuals maintain a constant, enduring relationship with the living dead. All of them together, the living and the living dead, including all members of the extended family, are connected and bound together into an inter-generational community. Further, the life-force is regarded as the invisible, essential reality of everything that exists, living as well as inanimate, with living beings possessing more of the life-force than the inanimate, and humans having the most. On the other hand, the living dead possess a great deal of the life-force, but do not have the physical body with which to effect actions that require such a physical, material entity. Consequently, one may think of the living human individual as existing in a physical, material universe in which the individual is linked intimately to all creation (living and inanimate) through the life-force.

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Matter and life-force thus merge into a unity, in which the lifeforce subordinates matter in a continuing dynamic and symbiotic relationship. The knowledge of this *life-force* and its effects in the universe is attributed, in the first instance, to God (Masolo 1995). Because of the undergirding community connectedness, such knowledge becomes a *community commodity* that preoccupies every individual in the community. Yet, there are some systems of knowledge and explanation that are the specific preoccupation of specialized groups within the community or larger society, such as traditional medical practitioners and healers and the sage-philosophers (Oruka 1990). These specialists have access to what is, in essence, godly knowledge.

In this larger world-view, then, the African scientist cannot become simply a worker, and employee, a lone ranger in the search for knowledge in the uncharted material arena with his/her physical apparatus of the brain and its associated neuronal and sensory systems, and the scientific instruments to extend the reach of that brain and its associated nerve systems. He/she has also to be a passionate believer in the inter-connectedness of humans with the entire nature and with God. Otherwise, the task of explanation, of discovery, of innovation, would be altogether very large, and the obstacles to understanding too great to face and overcome. For Africans, sharing knowledge with God is not a religious matter - it is a *spiritual issue*. Indeed, most African languages do not have a term for religion. The essence of religion, the Spirit, is integrated into all areas and dimensions of life and activities in Africa. Therefore, there is no hierarchical priesthood. In consequence, even though God is "outside" and "beyond his creation", his activities reveal him as being "near" (Mbiti 1969).

The important point to remember here is that, according to the African worldview, the brain is very much part of the material entity of the person, whereas the mind is the bridging entity between this entity and the soul. There seems to be some tentative scientific evidence in this bridging function. At a pioneering conference on the theme, "The Science of Morality", held at the Royal College of Physicians in London in February 2002, Dr. Peter Fenwick, of the Institute of Psychiatry in London and a consultant neurophysiologist at Radcliffe Infirmary in Oxford, highlighted recent results of interviews of 2,000 individuals who have had what is termed "near-death experiences". Under these conditions, these individuals often experience three sets of remarkable conditions:

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- They often experience feelings of peace and joy;
- They experience that they apparently enter into another world (where it is all light and love), very different from that they are just quitting; and
- They encounter a "mystical being".

Some of these experiences took place after the individuals had been certified "clinically dead", that is with little or no brain activity as recorded neurophysiologically. What the results suggest is that the mind (or consciousness) survives the death of the brain, and keeps on a lively functioning.

It can be seen, then, that attempts to estrange and isolate intellectuals and scientists from the society, earmarking them as producers and owners of knowledge, while others, members of the society, are merely consumers of that knowledge, is alien to the African world-view. It is not an acceptable position that only the individual thinks and constructs *knowledge*, while the rest of the society constructs *myths*. Rather, knowledge is regarded as a common, mutually constructed product of the dialogue between the scholars, the cultural practitioners and experts, and the social actors in the life of the society (Mudimbe 1988).

Using this African holistic social framework as a reference starting point, it is becoming clear that a person is more than body. He is more profoundly complex than being merely a physical entity - even if that entity possesses a full set of sense organs and a brain to manage and manipulate the avalanche of information being perceived every second by the diverse and innumerable sensoria of the body. The individual goes beyond the physical entity. There is, in essence, a living-force which constitutes the transcendental part of the individual - comprising the mind, the intellect, and the soul. It is this transcendental component of a human being, which confers to him/her the unique quality of human-ness - of ubuntu, of dhano. This transcendental essence gives humans the potential to evoke mind-tomind communication - and, therefore, a vast potential for synergistically increasing the power of thought, in any particular field, within an empathetic social environment of connectedness far, far beyond an individual's own sole capability. When this communion of interconnected minds becomes inserted into the mind of the Supreme (God), there is no telling what heights of creativity, of discovery and invention, of innovation and improvisation, are likely to ensue!

The power of contemporary science

Contemporary science has demonstrated its power many times over by its progressive penetration and dispersion of the dark clouds that formerly enveloped fields as diverse as cosmology and astronomy, the secrets of inheritable characteristics of living beings and their evolution, and the world of nanotechnology and femtosecond lives of sub-particles of matter. The application of such knowledge to marketdriven technological innovations in numerous facets of our globalized lives, and the metaphors that they have provided for our transcendental realities, have literally transformed our perceptions of who we really are and the basis of that perception or knowledge.

The contemporary basis of scientific knowledge relies on a troika of three pillars, since the late sixteenth century, from the time of Francis Bacon and the revisions that have gradually come subsequent to that period:

- First, the experience of reality, which has to agree with observable facts, quantifiable and repeatable by any competent objective researcher, and that can be tested repeatedly.
- Second, the employment of reason, in such a manner that this new knowledge is internally logical and consistent.
- Third, the employment of certain epistemic principles, which in themselves are non-verifiable. These include: the certainty of matters of fact; the plausibility of causality; the derivation of laws of nature; and "the faith in the continued identity and performance of things" (Schaffer 1997).

This third pillar is the hardest to sustain – if we rigidly insist that the basis of science is entirely objective and rational. This third pillar, as used now, unambiguously shows that the basis of science is nonscientific. It is squarely based on faith at the mega-level of the order of nature. At a lower level, including the macro-molecular level, the predictive power of hypothesis is certainly testable with rigour.

At the quantum level of reality, the basis of material things reveals itself as non-material – indeed as *transcendental* – and the process of observation by the experimenter creates reality. Thus, elementary particles exist as waves when not observed, and reveal themselves as particles when observed. Consequently, it is proposed that epistemic principles are to be regarded as rooted in nature; yet,

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they do not appear in the visible order of nature. They are, instead, rooted in the transcendental dimension of nature. They are *principles of the mind* – just as the moral principles are principles of the mind. And the mind is a natural extension of "the mind-like background of the universe" (Schaffer 1997). It is this mind-like background of the universe – meaning, God – that gives science the authority to reveal knowledge. Otherwise, no facts, including facts exposed by the so-called *scientific method*, exist by themselves. *Faith*, it turns out, is essential to the process of deriving facts. Why? We have no experience of cause-and-effect event; the principle of induction can only hold if the future resembles the past; and permanence and identity of any object are only assumed (Schaffer 1997).

If all this is inferred, then there is really no particular point of demarcation between the natural and the supernatural. The foundations of both science and spirituality are largely built on faith; at the same time, spirituality is, to a large extent, built on the foundation of longrange experiential observation, over millennia, which have then been formulated into hypotheses (and world-views) to explain the mysteries of life and existence. There is, consequently, a far larger dimension of reality that goes beyond the physico-chemical laws of nature. It goes beyond the arbitrary duality of science and spirituality.

Science does not necessarily have to be confined to the materialistic reality. It became so as the result of the historical circumstances of the eighteenth-century European Enlightenment, when science was able to liberate the European mind from the fetters of religion-based superstition and self-righteousness, and Aristotle's "sacred geography" which was derived from pure thought. On the contrary, spirituality, with its direct connectivity to the mind-like background of the universe, and its close association with faith and reason, has the potential to unlock the human creative capacity to a level never before manifested – provided a communion of mind-to-mind and mind-to-God is deliberately fostered by an enabling social environment.

What is being put forward here in this paper is a veritable transformation of the epoch-long debate regarding the apposition of science to spirituality – that is that the ultimate authority and source of power for both science and spirituality resides in the mind-like background of the universe. Albert Einstein is credited with once having stated: "Science without religion is lame. Religion without science is blind".

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Contemporary science is moving about lamely without the benefit of the power of Spirit. And it is clearly faltering, in terms of the current human condition. While religion has largely replaced the more basic spiritualism, it has found itself blunted by a spreading unbelief, because of its isolation from the new insights provided by the advancing frontiers of science.

What is the key message that we have all been missing? It is that we are all one, a unity – nature, man, God. We are linked together by the thread of Spirit of God, the ultimate source of wisdom and knowledge, of love and happiness, and of wealth and diversity!

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Knowledge, ignorance and limits of science

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The difference between what the most and the least learned people know is inexpressibly trivial in relation to that which is unknown.

Albert Einstein

1. Introduction

In this paper I propose to examine the relationship between knowledge and ignorance on the one hand and the intimate link between ignorance and the limits of science debate on the other. I will begin with two theses taken from Karl Popper's presentation in *The Logic of Social Sciences* (Popper *et al.* 1969). Of the two theses, the first thesis deals with the nature of knowledge and the second deals with ignorance. While most philosophers have paid a great deal of attention to various aspects of knowledge, very few have concerned themselves with ignorance. Following Popper's two theses, I will deal with the problem of ignorance from the viewpoint of epistemology. Such an analysis seems to be necessary in the context of an important debate on the limits of science. The paper will conclude with some reflections on the nature of the debate, especially in terms of the kind of questions it may present to a discipline like evolutionary epistemology.

2. Popper's theses on the relations between knowledge and ignorance

In his opening contribution to a famous debate with Theodor Adorno and others of the Frankfurt School on *The Logic of The Social Sciences*, Popper (1969, p. 87) began with the observation that,

"We know a great deal. And we know not only many details of doubtful intellectual interest but also things which are of considerable

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practical significance and, what is even more important, which provide us with deep theoretical insight, and with a surprising understanding of the world".

In his second thesis Popper pointed out,

"Our ignorance is sobering and boundless. Indeed, it is precisely the staggering progress of the natural sciences [to which his first thesis alludes] which constantly opens our eyes always to our ignorance, even in the field of natural sciences themselves. This gives a new twist to the Socratic idea of ignorance. With each step forward, with each problem which we solve, we not only discover new and unsolved problems, but we also discover that where we believed that we were standing on firm and safe ground, all things are, in truth, insecure and in a state of flux" (p. 87).

On the basis of these two theses (which may appear to contradict one another), Popper argued that it is a fundamentally important task for epistemology to discuss the tension between knowledge and ignorance and clarify the relations between the two aspects of philosophy of knowledge. An important implication of this relationship between knowledge and ignorance is that it raises interesting questions concerning man's status as a knowledge seeker and the limits of such seeking. As already indicated, one interesting point to note about philosophy of knowledge is that while it has dealt with the concept of knowledge in various ways, it seems to have paid little attention to ignorance, and as one commentator puts it, "(t) his omission is striking since, prima facie, it would seem that ignorance should be as significant in epistemology as evil is in ethics" (Townley 2000, p. 1). He also points out that it is necessary to understand ignorance as the counterpart to understanding knowledge as this would enable us to develop a more coherent account of central knowledge practices, such as, for example, the role of testimony in gaining knowledge.

Now the question that arises is, "What is ignorance?". According to one definition ignorance is lack of knowledge about a thing in a being capable of knowing. In other words, fundamentally speaking, and with regard to a given object, ignorance is the outcome of the limitations of our intellect itself or of the obscurity of the matter itself. Thus it can be seen that there is an important connection between the concept of ignorance and the problem of limits of scientific knowledge. This point becomes clear in the observation made by Lehman (1977), a computer scientist, in a volume of collected articles published under the "tantalizing" title The Encyclopaedia of Ignorance (Duncan and Weston Smith 1977). Lehman declared, "Total knowledge, the final state, can never be reached. Ignorance must always be present" (Lehman, p. 354). According to another definition, given by the philosopher Michael Zimmerman, "Ignorance... is the failure to know the truth" (Zimmerman 1997, p. 412). But this raises serious questions about the nature of truth and the nature of knowledge in the absence of truth. From an epistemological viewpoint it seems easier to define knowledge than to define truth. Judith Schlanger, in her analysis, observes that "in principle (all of knowledge) could be organised into a finite number of areas and fields ... the reverse side of knowledge, however, offers us no such really definable territory" (Schlanger 1995, p. 3). She also offers a taxonomy of three major types of ignorance. First is "learned ignorance, or docta ignorantia" (p. 4). This refers to the idea that one has enough knowledge to have a general idea of what one does not know. This type of ignorance plays an important role in the context of the limits of science debate. The second type of ignorance is related to "the inequality of knowledge", which is "more disturbing and radical than inequality of birth and wealth" (p. 4). The third type of ignorance is the "more vulgar and widespread kind of ignorance, the kind that results from a lack of intellectual desire" (p. 5). This is also known as indifference.

3. On the relations between ignorance and limits of science

Despite its deep epistemological significance, it is surprising to note that there is no reference to the problem of ignorance in the limits of science debate. The point I am trying to make is this. Earlier I referred to man's status as a knowledge seeker or as a knower to put it in terms of the evolutionary epistemology of Donald Campbell (1974). The question to be asked in this regard is, if scientific research has reached its limits as John Barrow (1996) and others have argued, what would happen to our understanding of man as a knower or as a knowing being? Second, the limits proponents seem to indicate that in those areas where limits have been reached (or would soon be reached) ignorance has been conquered to a considerable extent. At the same time, the limits argument also seems to indicate certain inevitability of ignorance because of the inherent limitations of our intellect.

Keeping these questions in view, it might be useful to examine the kind of arguments present in the limits of science debate. In one of the

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earliest discussions on limits of science, the physicist Wigner (1967) observed that the most remarkable thing about science was its youth. Tracing the beginning of modern chemistry from the date of the publication of Robert Boyle's Sceptical Chemist in 1661 to contemporary developments in the 20th Century, Wigner argued that modern science was just about 300 years old and that this had to be compared with the age of Man, which is more than 100,000 years. After commenting on the explosive growth of scientific knowledge and the exponential growth in the number of its practitioners. Wigner identifies the limitations of scientific growth in the human intellect, in its capacity for sustained interest and learning, in its memories and facilities for communication. He also observes that modern science has changed in two ways, that is, science has changed not only by acquiring new territories but also by shifting from older to newer fields. However, considering the rapid manner in which the changes have taken place, there would be limits to further development in both ways. In the case of acquisition of new areas, there are problems related to one's memory. One forgets and focusses attention on more recent developments. Thereby the older parts of science cease to be parts of our science because nobody has a strong desire to know them, that is, nobody who is interested only in the new parts. Also, there are definite limits to which a newer discipline deeper than the older one could embrace it as a mere approximation. For example, the replacement of ordinary mechanics by quantum mechanics, followed by further replacements with the emergence of relativistic quantum theory, which as a current theory is already four layers deep, shows that there are limits to this type of development.

In spite of his pessimistic observations, Wigner does try to identify certain stabilizing forces to overcome what he calls the balkanisation of science (where disparate and incompatible scientific disciplines get mixed up). One such stabilizing force he identifies with the emergence of a human being whose mental abilities and capacities would be much greater than ours. This last point, one can see, is linked to our first question – man's status as a knower - and in turn raises another important question. Does the overcoming of limits of science depend on the creation of superior beings in a continuous process of evolution and does this happen in response to the growing complexity of knowledge creation? While Wigner ends on a positive note, such optimism seems to be missing from the current discussion of the limits problem as can be witnessed in the works of Barrow (1996) and Horgan (1996).

Knowledge, ignorance and limits of science

In his paper on *Limits of Science*, Barrow (1996) deals with what he calls an "impossibility" theorem. In particular, he deals with four general types of limitation which could prevent the completion of the search for a "Theory of Everything" - "by which particle physicists mean simply a unified description of the laws governing the fundamental forces of Nature" (p.1).

a. Existential limits

The basic question to be asked here is whether such a theory exists at all. At the root of this issue is the old philolsophical problem of distinguishing between knowledge of the world and knowledge of our models of the world, a distinction which is also implicit in the well known Kantian distinction between noumenon and phenomenon. As Barrow puts it, "limitations upon our abilities to understand fully the latter" might be best interpreted as "limits of scientists" rather than limits of science.

b. Conceptual limits

Even if we grant that such a theory does exist, then with what confidence can we say that we have the ability to comprehend it? This, as Barrow (1996) observes, depends upon how deep a structure it is. In a manner reminiscent of Wigner, Barrow observes that it is impossible to imagine an infinitely deep sequence of structures that could only be partially fathomed. The problem with the theory of everything in this context is that it may not be that deep at all. In other words, "the theory may lie only slightly below the surface of appearances and be well within our grasp to comprehend" (Barrow 1996, p. 3). Also, "it also does not follow that the most fundamental physical laws need to be the deepest and most complicated aspect of the universal structure" (Barrow 1996, p. 3).

c. Technological limits

Now, even if one could overcome the first two limits, testing such a theory could be technologically very difficult. The decisive features predicted by such a theory could lie well beyond the reach of current or even foreseeable technological capability. Apart from problems related to the attainment of high energies, there will be restrictions of economics and engineering, or the pressing nature of other more fruitful and vital lines of inquiry and constraints which might doom direct probes of the validity of such a theory.

d. Fundamental limits

Finally, there are impossibility theorems which set the boundaries between what can be done and what cannot be done, between what can be answered and what cannot be answered. An impossibility theorem insists on a proof using the assumptions of a given theory, a proof which sets the boundary between the possible and the impossible. Several examples come to mind in the present century – Heisenberg's uncertainty principle in physics, Godel's incompleteness theorem in mathematical logic, Arrow's theorem in economics and so on. "It may transpire", as Barrow observes, "that these impossibility results may place real restrictions on our ability to frame or test a theory of everything" (p. 8).

Conclusion

On the basis of his analysis, Barrow (1996) concludes that the theory of everything might have to confront impassable barriers. As he sees it, there are clear limitations, both the historically conditioned type and the transhistorical, inherent type. It is the latter type which suggests that there might be an unbridgeable gap between the known and the unknown and that there is a realm of the unknowable completely inaccessible to any kind of human endeavour. But whereas Barrow, Wigner and others deal with the limits problem (including some notion of ultimate limits). Horgan (1996) in his book *The End of Science* goes one step ahead. He deals with the end of science, as an ultimate condition wherein all exploration, knowledge, enterprise seem to have reached their final state of inquiry and representation – be it in physics, cosmology, evolutionary biology or even social science. Horgan's chief concern is whether science, instead of being stopped solely by external factors, would be undermined by decadence from within.

To sum up then, after all these discussions and reflections on knowledge and ignorance, the known, the unknown and the unknowable, one is left with two questions – where do we go from here – towards the cutting edge of knowledge or towards the cutting edge of ignorance? and whither scientific progress?

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Faith and the pursuit of understanding in science and religion

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I am very pleased to be here. I am also a little hesitant to give this talk, because the subject is one which involves many subtle and difficult problems and questions. In addition, I will be speaking largely from a Western European and American point of view. I wish I were more familiar with Indic philosophy and culture, because I know that you have a long history of very deep religious and scientific ideas and experience in your tradition. In fact, I want to quote a translation by V.V. Raman of one of the early Vedas. It says:

Who really knows, and who can swear how creation arose, when and where? When and how did creation start? Did He do it, or did He not? Only He up there knows. Maybe, perhaps not, not even He.

Raman goes on to comment that the Vedas are among the very first articulations in human culture of the synthesis of science and spirituality. Now, of course, particularly in the nineteenth century, science and religion seemed to split. People began to feel that they were inconsistent. In the modern period, there has been a good deal of struggle back and forth, particularly in the West. I believe the Indic tradition has always looked at the world as united, and at science and religion as united. For my part, however, I must approach the topic as a scientist from the United States. I wish to reflect on the significant changes of the last few decades and the new discoveries in science, which I think, are making a difference for the discussion of science and spirituality.

Now, to do this clearly, I will first have to define what I mean by science and what I mean by religion. Science is the attempt to understand the structure of our universe and how it works, including

ourselves. We try to understand what particular objects are, how they work, and so on. That is science. Religion is the attempt to understand the purpose and meaning of the universe, including our own lives. Now, if there is a purpose and meaning to the universe, that must have something to do with its structure and behaviour. So, clearly there is a relationship between science and religion that can be inferred if we study the matter carefully. There is a necessary connection between the structure of the world and any existing purpose.

This relationship was not seen very well for some time. Particularly in the nineteenth century, science seemed to many people to destroy the beauty of the universe and its mysticism. Here, for example, is what the great poet Edgar Allen Poe said at that time:

Science! true daughter of Old Time thou art! Who alterest all things with thy peering eyes. Why preyest thou thus upon the poet's heart, Vulture, whose wings are dull realities?

("Sonnet To Science", 1829)

And Wordsworth wrote:

Sweet is the lore which Nature brings; Our meddling intellect Misshapes the beauteous forms of things: --We murder to dissect.

("The Tables Turned", 1798)

Now, those were common views in the modern period. But there was also a different view; it is the one I wish to emphasize, for I think it is a more accurate one. This is what was said by Pope:

He who through vast immensity can pierce, See worlds on worlds compose one universe; Observe how system into system runs, What other planets circle other suns, What varied being peoples every star, May tell why Heaven [Comment 1] has made us as we are.

("Essay on Man", 1733)

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Pope's view, I think, is more in line with the contemporary view of science and its relation to our understanding of the universe and of religion.

There are two fundamental reasons why I believe that religion and science must be parallel and must interact. One is that, if there is purpose and meaning in the universe, then the purpose must be related to its structure – and in fact must determine its structure. The second is that in both fields we use all our human abilities in a quest to understand the world we inhabit. Religion and science are more similar in terms of our efforts to understand than we normally think. Among the general public, it is very common to believe that scientists simply design their experiments, write their equations, use logic, and then conclude, objectively and without questioning, what the truth is. And that is it. Religion, on the other hand, is often viewed as a matter of faith alone. In this view, religion is about things we do not know and cannot prove, things that belong to the domain of the emotions. In fact, though, we use all our human abilities in both endeavours. In both realms, we want to understand. The Nobel Laureate scientist, Bridgman of Harvard University, who was also known as something of a philosopher as well, was once asked to define the scientific method. Bridgman said, "The scientific method? Why, that is to work like the devil to find the answer, with no holds barred". Well, that is just what it is. We use our every instinct, our every ability, to do the best science of which we are capable. I deeply believe that the same is true in religion. The emphases may be different, but the striving to understand is similar. And this striving to understand, using all our abilities, represents a broad parallel between these two great activities of the human spirit.

One fairly recent development, which has received increasing attention over the last few decades, is that we are increasingly recognising what is frequently called "intelligent design", by which I mean the intelligent design of the universe. Although this idea is sometimes questioned, I find the data to be fairly convincing that somehow our universe is very special – so special that it could only have been intelligently designed. We have only recently recognised that the laws of physics have to be very, very precisely what they are for us to be here at all. The ratio of the force of gravitation and the nuclear forces (of all things) have to be precisely what they are in order for the wonderful stars to exist, and for nuclear energy to continue to provide energy for our star, the Sun, over billions of years, and also for such stars not to explode or collapse too rapidly, and so on. We recognise that electrical forces and nuclear forces must also have very close to the exact ratio they do in order for all the chemical elements that we enjoy to exist – the very chemical elements out of which we are constructed. Most of these chemical elements are made in the interior of stars. We ourselves are thus stardust, manufactured during the long lives of stars, which then burst and throw their manufactured chemicals out into space. But for all of those chemical elements to exist, including the common nitrogen and oxygen on which we are so dependent, the laws of physics have to be almost exactly what they are. One could go on to list many, many other features of the physical world we see around us; in each case, science has come to recognise that the underlying physical laws and constants have to be very precisely what they are. Somehow, this is a very peculiar, strange universe: it comes out exactly right for us to be here. If it were any other way, we simply would not be.

Fred Hoyle, the famous British scientist, who was something of a skeptic concerning religion, discovered how carbon is made inside of stars. He discovered a very unusual relation between carbon and oxygen, compared their energy levels, and demonstrated how these features allowed for nuclear reactions to make both carbon and oxygen, resulting in the large quantities of these two elements in the universe. And, of course, it is these two common elements on which we are very much dependent. After Hoyle discovered these facts, he was absolutely amazed what a remarkable accident it was that these precise features would exist, that the universe would be constructed in just this way. He wrote the following:

Would you not say to yourself: some super-calculating intellect must have designed the properties of the common atom. Otherwise, the chance of my finding such an atom through the blind forces of nature would be utterly miniscule. Of course, you would. A commonsense interpretation of the facts suggests that a super-intellect has monkeyed with physics – as well as with chemistry and biology – and that there are no blind forces worth speaking about in nature. The numbers, one calculates from the facts, seem to be so overwhelming as to put this conclusion almost beyond question.

But that is not the whole story. We have now discovered the Big Bang as well. The Big Bang says, yes, there was a unique moment in

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the history of our universe, a first moment at which it began. In any case, it was a unique moment about 14 billion years ago, followed by a period of rapid expansion, creation of the stars, and so on. This whole series of events had to happen in precisely the way it did in order for us to exist. If you add up all of these things, the probability of our existence seems miniscule, as Hoyle said of even the common atom. Most scientists, I think, have to agree with that conclusion.

If one wishes to say that this still does not mean there is any purpose in the universe, that it is just an accident, then he has to say that there must be billions of other universes out there somewhere (the so-called multiverse theory). Of course, we cannot contact them; we are separate. But, somehow, lots of universes have been created, each with different physical constants. They are out there, and it is just by chance that we are here, that we are in the one where life can exist. The multiverse theory is a possible postulate, but it is a rather remarkable and extreme postulate. For example, we do not know how the physical constants can vary. Nor do we know what makes them what they are. There are about eighteen different constants that define what we know now as Physics and Chemistry, constants that make this universe what it is and allow us to be here. Why do they have the values they do? How could you vary them? How can you make them different? If we had other universes, would they have different values, and what would they be? Furthermore, one can postulate that there is an infinite number of universes out there somewhere, but we cannot test this postulate. That is hardly normal science! Nevertheless, it is a possible postulate. If one does not accept it, as I do not, then one has to admit that, in fact, this very special universe seems to be designed.

The classical view of science has generally been that there is nothing special about our universe, and nothing special about us. We are just accidents, the result of atoms being created, and coming together, stars making chemical elements that fall together and produce humans. It is just all an accident with a reasonable probability of happening, and that is why we are here. Religion, of course, says no: there is something very special about us, about our world, and about our universe. Recent scientific discoveries and examinations of the results have to agree, in my view, that there is indeed something very special about the universe we inhabit. Yes, there is something very special here, something that is difficult to explain away. Only by making the extreme postulate of many otherwise undetectable universes can one avoid this conclusion.

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I have to say, however, that this is particularly the view in the physical sciences. The biological sciences have not, in my view, come to recognise this point so fully. Biologists will say, Sure, life has to be found on a planet, of course. Such a planet has to have a reasonable climate, but given appropriate conditions, molecules will eventually fall together and form life. I think biologists are rather inclined to say that the process works all by accident. Of course, there is a Darwinian theory about how life develops in different forms, which represents our best scientific account of the process. Nevertheless, we do not really know how life formed on earth. Yes, molecules came together somehow. But, if we simply estimate the probability of the right number of molecules coming together to form the smallest bit of life, that probability is so small that we can hardly conceive it would have happened. I think it is more reasonable to conclude that the molecules are specially made so that, they tend to come together in a particular way. As a result of the laws of physics, which reflect intelligent design, molecules have a particular nature so that, when they touch together and react, it is somewhat likely that life will develop. Perhaps, there are other special features of design and history that we do not yet understand, which also increase this probability.

We know, furthermore, that all life on earth is related. We know this because our critical molecules are all left-handed. These critical molecules are extremely complex, and one of their features is that they can be either left-handed or right-handed. If the right hand is just as good as the left hand, we could presumably have right-handed molecules that could make life. But, we all are made of left-handed molecules. So we are all related. Hence, we know that life could not have started more than may be once or twice. May be a right-handed form of life started once, and then died out. But, since it cannot have started more than a very few times, we know that the formation of life is in fact very rare and special. How it happened at all, we just do not know.

Let me conclude with a few final words about the parallels between science and religion, since they are crucial for our understanding of these two different human responses. I mentioned already the popular view that science and religion are completely different. It is often said, for example, that religion depends on faith. Well, yes, there is faith in religion; but there is also faith in science. Usually, we call it an "assumption" – an assumption we believe in. Scientists make assumptions, and from them we conclude that this and

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that ought to happen. One of the assumptions we make, and which religion also makes, is that this universe is reliable and consistent (the so-called principle of the uniformity of nature). Monotheistic forms of religion have, in particular, insisted that our world and our God are reliable and consistent. Interestingly, science also needs the same assumption of consistency, which serves as a fundamental postulate for scientific research. For example, if I were to drop my pen, you would know in advance that it will fall on the floor. One can repeat the experiment at any time and obtain the same results. Indeed, we also know that it will fall at a certain rate of acceleration and speed. We presuppose this sort of knowledge all the time in our everyday lives. Why is the physical world so reliable? We can't exactly say why. We cannot prove that the physical laws will be the same tomorrow as they are today, but we have every faith that they will be. In the end, this is a postulate, a fundamental assumption, an act of faith. The principle of the uniformity of nature is a rather extreme case, perhaps. But one could list many others as well.

One of the common assumptions that scientists have made in the past is that this universe has always been here. This is the hypothesis of the steady-state universe; it was Einstein's assumption, for example. When he first created general relativity, he had to put in a special constant to keep the stars from falling together. He added this constant to his equation, and then later he learned from Hubble's measurements that actually our universe is expanding. Einstein later admitted that he had made a terrible mistake by adding the constant. Nevertheless, most scientists assumed or had faith that the universe has been and will always be here. Fred Hoyle was another scientist who struggled very hard with this dilemma. He had evidence to believe that ours is an expanding universe, yet he held the assumption that it had always to be the same. The only answer he could imagine was that new atoms were being created all the time in interstellar space. In the end, Hoyle could not live with this conjecture, and eventually he abandoned it. The story of Hoyle is a good example of how a core faith or assumption - the assumption that our universe has always been here and is always the same - can be a source of great struggle for scientists over a long period of time.

The belief that our universe has always been here has been a common belief, and in my view a common anti-religious belief. It entails that there is no creation involved. Interestingly, it was Chairman Mao's view as well; among his philosophical beliefs was the conviction that the universe has always existed as it is. When I first went to China and began to talk to astronomers there, I learned a good deal about his views. Chairman Mao had emphasized the point that astronomy was one of the most important sciences for the Chinese to study. "Why?" I asked. Well, I was told, because it disproves the existence of God. If you study the universe, you know there are lots of stars and all kinds of planets. Scientific study makes it clear, Mao thought, that the universe has always been here and there is nothing unusual about humankind. He believed that such a view disproves the existence of God, and for that reason it was important that Chinese astronomers should study it. The trouble was, by then the Big Bang had already been discovered. My Chinese colleagues, whenever they spoke in public, had to speak against the Big Bang, in order to fulfill Mao's dictum. Of course, that restriction has changed now.

I have tried to show how our instincts and assumptions operate in science and in religion. Contrary to a certain popular myth, we make assumptions in science as well as in religion. In both fields, practitioners rely on a deep faith, which plays a large role in motivating what they do. In the 20th century, scientific faith included belief in the uniformity of nature, belief in the permanence of the universe, and belief in the reliability of physical laws. This included a completely deterministic universe, which has now been disproved by the discovery of quantum mechanics. Scientists no longer believe in a world for which the future can be completely predicted by physical laws. As in these cases, sometimes our scientific faith turns out to be not right. But there is no doubt that faith is crucial in science just as it is in religion. We can also recognize that the quest for understanding and the use of intuition are fundamental in religion, as they are in science. These parallels - and there are others that we could discuss as well - help to show how science and religion can be compatible. Giving the parallels, we should never treat these two great dimensions of the human spirit as fundamentally different or fundamentally opposed. As our understanding of each increases, my own faith is that they will increasingly grow together.

A response to the address of Prof. Charles H Townes

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We have had an intellectual as well as spiritual treat during the last one hour. Prof Townes began his lecture with an analysis of the convergence of science and religion. He went on to make incisive remarks on the structure and purpose of the universe. The late Prof Cyril Ponnamperuma, who was one of the 20th century leaders in exobiology, used to remark that one reason for his interest in life on other planets was to understand whether DNA as the chemical substance of heredity on our planet was a biological accident or biochemical necessity.

Rabelais once said, "Science is but the conscience of the soul". The confluence of science and religion should be reflected in all areas of human enquiry. The growing violence in the human heart that we witness today underlines the urgency of ensuring that science and technology are employed for human happiness and not its destruction. The Pugwash movement, which I am now privileged to lead, has been constantly reminding scientists of their ethical responsibility for the consequences of their research and governments of the immorality, illegality and peril inherent in nuclear weapons. Advances in recombinant DNA technology provide opportunities for causing even greater harm to human health and security through new forms of disease-causing organisms.

The much misunderstood Indian concept of *karma* provides an opportunity throughout one's life for self-analysis, self-criticism and self-correction. It helps one to go deep into the question – what is right and what is wrong? Not far from this beautiful auditorium, there is an even more beautiful shrine devoted to the life and message of Ramana Maharshi. He did not talk much, much less preach. He asked each one of us to undertake a voyage of discovery – who am I? He also urged

that we should control our ego, since ego prevents one from growth, both spiritual and scientific. This calls for a culture of humility and respect for views not in agreement with one's own. Erwin Schrödinger's book *What is life?*, published nearly 60 years ago, highlights the scientific significance of the *advaita* (non-dualism) philosophy of the Vedas, so well-articulated by Adi Sankara. According to Schrödinger, the concept of *advaita* is the one closest to the facts of genetics. We in India have, therefore, been inheritors of great wisdom from Vedic times. Therefore, we should provide leadership to the movement for blending science and spirituality, so well articulated by Prof Townes.

Talking about the control of ego and thereby avoiding spiritual and intellectual self-destruction, I wish to cite an event which took place at the Physical Research Laboratory at Ahmedabad on the occasion of Prof CV Raman's 80th birthday. Vikram Sarabhai and his wife Mrinalini had arranged an excellent dance-drama on that occasion. When some one asked Prof Raman why he wears a turban all the time, his reply was "the turban helps to avoid my head getting swollen up with the encomiums being paid to me all the time". I feel this is a profound statement in the sense that a person is conscious of the fact that succumbing to praise will only bring one down and not take one to greater heights of achievement.

Pascal said long ago, "Science is like a sphere in space; the greater its volume, the greater its contact with the unknown". John Maddox in his book *What Remains to be Discovered* has made the same point. Scientists like Alexis Carrel have also underlined the need for humility which alone can lead to an understanding of what we do not know.

Today, we need, along with humility, love of diversity and pluralism in thought and belief, compassion and tolerance. NIAS was founded to convert Jawaharlal Nehru's concept of scientific humanism into reality. Prof Townes is an outstanding representative of this breed of scientists. He has always believed in the dictum "remember your humanity". He has had the courage of his conviction and has followed the path of what we call *dharma*. There is much we can learn from his life and work. I would like to conclude with a quotation from Samuel Johnson, who wrote single-handed the first English Dictionary, "If all possible objections had first to be met, nothing new would ever be attempted".

I know the wisdom behind this statement from my 'green revolution' days.

A response to the address of Prof. Charles H Townes

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ā nō bhadrāh kratavō yantu visvatah

Let good thoughts come to us from all directions

The remarkable similarities between the methods and practice of science and religion, and the growing need to develop a holistic approach in our attempts to understand Nature, have been brought out with remarkable clarity and emphasis in the address by Professor Townes. From his address, it is clear that the same physical, intellectual and spiritual struggles are involved in the pursuit of both science and religion. He is a man of extraordinary distinction in science and has been deeply concerned about the interplay amongst science, society and human values – all this scholarship and introspection has produced the beautiful synthesis that was brought out in his presentation.

Since the ultimate truth is but one, there is a universality to the essential thesis he has presented, traversing across not only space and time, but also social and cultural diversity. The emphasis might change and the nuances may evolve but the fundamentals of the thesis remain the same, whether we look at the truth at the time of *Buddha*, *Christ*, *Shankara*, or today. Yet, I thought that it would be appropriate to highlight the same truths from the Indian perspective.

Elsewhere, Professor Murli Manohar Joshi has pointed out that "In the long history of civilisations, the Indian civilisation is one of the few for whom the scientific impulse to enquire and to know has been the defining feature of its existence. The task or the '*dharma*' of each individual was to pursue through a breathtakingly wide choice of methodological options the ends of true knowledge and enlightenment".

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As a matter of detail, it is to be noted that the Cartesian dualism between the material and the spiritual domains did not occur in India; by and large, a holistic approach was invariably taken until very recently. On the same count, India sadly missed the influences of Galileo, Descartes and Newton, which would have infused a new dynamism into Indian thought; the seeds of their ideas were indeed present in the early philosophical works and these would have been welcomed warmly here, had they reached us during the Post-Renaissance period. Karma, as Professor Swaminathan has said, is one of the deepest underlying concepts of Indian philosophy. It means right action, action which is sustaining - or "dharma" to use another word from Sanskrit. Indeed, the need for the conjoined influence of Science and Spirituality to carry us forward was brought out beautifully in the analogy by Professor Roddam Narasimha that they are like the two wings of a bird. It is, perhaps, only during the last 100 years, under the pressure of specialisation in the variegated fields of knowledge, that the beginnings of a separation may be noted. However, science today is bringing out so many issues that demand a holistic approach to the truth that an actual dichotomy may not occur at all and instead a new synthesis may be reestablished in the spirit of the pithy remark of Einstein "Science without religion is lame and religion without science is blind". We need the eye of science to see and the goadings of religion to drive us into right action.

Science, time and again, has thrown up challenges for our understanding. For example, even though the evolution of the wave function in quantum mechanics is as precisely deterministic as the evolution of a trajectory in Newtonian mechanics, the observation process leads to the so called collapse of the wave function. Further, the wave nature associated with particles and quanta gives rise to the Einstein-Podolsky-Rosen Paradox, the apparently acausal correlations related to which have been observed in the famous experiments conducted by Aspect. We have to view this as a conundrum to be solved, rather than ascribe an acausal non-locality to quantum mechanics, and we should examine the various aspects of wave function collapse through well-designed experiments. For there exists a remarkable harmony and unity in all of physics - if any part has acausal behaviour, then we should be able to concatenate arguments to show acausal behaviour in any other branch we might choose. Such universal laws like causality were termed as *rtam* in the Vedas. Once God has made these laws, which are anādi, i.e., always in existence

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without beginning, he just allows the world to evolve in accordance with them without interference.

Either by a fortuitous coincidence or by an intuitive leap from the spring board of calendric astronomy, the early Indians recognised the existence of the Universe over billions of years. The long periods needed for the multi-planetary conjunction also gave rise to the idea that the Universe itself may be oscillatory with extremely long periodicities, the universe recreating itself each time from some primal energy. Thus, the modern findings of science became easily acceptable, including the great vastness of the physical universe. Also by the time of the Vishnupurana, the Dasavatara depicted the origins of the species as fish, tortoise, boar, man-lion beast, pygmy, giant, militant man, man, divine man, fully enlightened man, Matsya, Kūrma, Varāha. Narasimha. V**ā**mana, Trivikrama, Parasurama, Rāma, Krishna, Buddha, this again helping us to accept Darwinism and the findings of modern science.

This acceptance of scientific findings without undue prejudice was also due to the great influence wielded by the philosopher of the 8th century, *Shankara*. Amongst his many *Sutras* or aphoristic rules I would like to quote two.

na ca dhrste anupapannam nāma, dhrstvāt eva

Facts of perception cannot be challenged on the ground of improbability because they have been perceived.

na ca anumānam pratyaksa virodhe prāmānyam labhate

An inference is no authority against perception.

To put it in the modern language of science, beautifully conceived theories may have to be abandoned, when they contradict the findings of carefully performed experiments.

Having shown that there were no traditional barriers in the acceptance of science in India, I now turn to a very perspicacious remark by Professor Townes: Progress in science has occasionally negated both strong scientific assumptions and strong religious beliefs. It is in this context that *Shankara's Sutrās* are especially helpful in adopting the correct perspective, in our efforts towards greater understanding. Thus, the responsibility of all of us, especially my

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young colleagues, is to respond energetically to the clarion call sounded by Professor Townes, unfettered and unhindered by philosophical misgivings.

Further, emphasising the similarities of the methodologies of science and spiritual quest, Professor Townes lists faith or postulates, experiments and observations, intuition and revelation, logic and reason and finally aesthetics, as the essential ingredients of both. On these, he also rightly brings to bear the limitations of logic, even mathematical logic, as exposed by Gödel's theorems, which state the inadequacy of a finite set of axioms. We may view this apparent limitation positively and note that science is an open-ended quest for knowledge. We may be compelled to postulate additional axioms under dire necessity, imposed on us by new experimental results or even at times by philosophical, conceptual or mathematical aesthetics, and thus proceed further towards an even increasingly deeper appreciation of the truth.

Despite these apparent limitations, there obtains in Nature a beautiful harmony which made Einstein refer to the presence of a Cosmic Intelligence and, wondering about the fine balance and harmony with which different parts of physics fit together, he remarked "What really interests me is whether God had any choice in the creation of this world". The physical world is like a jig-saw puzzle; you can put it together only one way and you cannot move the pieces in any arbitrary way. For example, I have already mentioned a fundamental difficulty in quantum mechanics, which has given rise to the Einstein, Podolsky and Rosen paradox. Should we take the stand that quantum mechanics includes acausal non-locality? The Indian perspective with its adherence to the concept of *rtam*, as noted before, would rather struggle, if need be with an additional axiom, to construct theories which encompass and extend quantum mechanics. A natural law, when it allows violation at any one place, through a concatenation of processes, leads to violation at some other place of choice, and will thus no more be a natural law.

The workings of this world, harmonious as they might be, are very subtle, and observations repeatedly bring out aspects that pose great challenges to scientific explanation. The ultimate amongst these is the very creation of life on this planet, especially of human life, with the intelligence and capacity for articulation and organisation. Often, faced with such challenges, one is tempted to attribute our inability to find an explanation to various scientific phenomena and say that this

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proves the existence of God. Addressing such kaleidoscopically changing doctrines of the "God of the gaps", which are hypotheses to account for phenomena as yet only partially explained or not explained by science, Einstein forcefully rejects them as "not only unworthy but also fatal" to be proved wrong with every step-wise progress in science. Professor Townes has subtly cautioned us against this.

This brings us to the last aspect of science and spirituality that I would like to comment upon here. The general Indian attitude towards this is succinctly captured in the expostulations of *Arjuna* to *Krishna* on the battle fields of *Kurukshetra*.

vyāmiśreneva vākyena buddhim mōhayasīva me tadekam vada niścitya yena śreyōhamāpnuyām

Arjuna demands that Krishna abstract the ethical principles that emerge from all this ratiocination of religion, science and spirituality. This is the demand that every man places upon both science and spirituality of religion. An answer to this demand in the modern idiom would be useful: The reductionist approach to science and the observations of astronomy have clearly pointed out our connectivity with the rest of the Universe and with grand events like the big-bang and supernova explosions that occurred in the depths of time. Similar is the message of modern biology, and indeed our close interconnectivity with both the living and non-living universe is deep and intimate. But as Whitehead has lamented, "Science can find no individual enjoyment in nature;it finds mere rule of succession". We can resolve this impasse only by augmenting the reductionist approach with an additional axiom, viz. "all actions and attributes that support the positive evolution along the arrow connecting the big bang to man are endowed with a positive value, and our efforts should be directed to favour this positive evolution". For example, love of humanity, as emphasised earlier by Professor Ellis, non-violence and efforts towards betterment of the world will now be endowed with positive value, just as the spiritual and religious leaders have been telling us all along. With this extra axiom, jñāna becomes sujñāna or prajñāna or suprascience to translate it loosely. This extra axiom thus allows us to bridge the gap between science and spirituality and gives meaning to lives dedicated to bringing peace and tranquility to this world and to lives dedicated to the quest of truth and beauty in nature. It guides us into mindful action which will bring us sreyas.

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I want to close my brief response, expressing my great admiration and respect for Professor Townes. I have learnt a lot from him, not only today, but over the last several decades. I have been one of his students just like *Ekalavya* was *Dronāćarya's*.

I conclude this brief response by congratulating and expressing our indebtedness to Professor Townes for eloquently pointing out the commonality of the spirit behind religion and science.

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Overview Science and Spirituality East and West

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The foregoing volume is rich and provocative. Those who have worked their way through its broad array of topics, positions, and authorial viewpoints will already know that no single author's conclusion can pretend to do justice to all the pieces. Indeed, perhaps this volume comes closer to the truth *because* it encompasses a wider range of reflection on the topic than most books contain. To retain the balance of perspectives, one should read these words in conjunction with the opening introduction by Roddam Narasimha, which effectively summarizes the diverse insights concerning Indic perspectives on cosmology, consciousness and technology.

If this final chapter is to make some humble contribution to the volume as a whole, it must come to the topic from a comparative perspective. During the last seven years, I have had the privilege to organize conferences and private consultations on science and spirituality in a number of different countries under the auspices of the Science and the Spiritual Quest (SSQ) programme. Between 1995 and 2003, SSQ held 16 private three-day workshops in two continents, involving 123 leading scientists in constructive dialogue at the intersections of science and spirituality. The programme then organized 17 public events in nine countries on four continents. Taken together, these events reached close to 12,000 audience members firsthand and many millions more through the media - some 250 million, according to the official estimates of one media research firm. Six books covering the research output of SSO have been published or are currently in production on four different continents. The organization's website, www.ssq.net, lists four full-length video products and contains a large amount of supplementary material; further excerpts from the SSO programme are available through the Counterbalance Foundation

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(www.counterbalance.org). In all, 48 different organizations, institutions and financial supporters became allies in fostering these conversations. We were especially privileged to be able to work with the National Institute of Advanced Studies in Bangalore in arranging the events which produced this volume.

Participating in these meetings with scholars of great minds (and hearts) from around the world, watching them struggle to relate their philosophical and spiritual commitments to each other's commitments and to science, was without doubt one of the most intellectually stimulating and rewarding experiences of my life. If the present chapter can offer anything to rival the insight of the chapters that precede this one, it must lie in an appreciation of the contributions of the Indic traditions in their similarities to and in their differences from the world's other great philosophical and spiritual traditions. It is to this task that I now turn.

Comparing cultures, comparing religions

One of the unique strengths of the present volume is that it approaches the question of science and spirituality (or science and "the Beyond") from the perspectives of both East and West. Could it be that the authors' diverse interpretations of the East-West dialogue offer some hints of the diverse ways that science and spirituality might be related?

Consider the following three paradigms for relating East and West. First, for those who write from the mystical perspective, East and West seem in many ways to be conveying the same truth. Thus, Bruno Guiderdoni finds no tension between Western and Eastern approaches; he incorporates elements of both in his Sufi understanding of the science-religion relationship. Others who write in a more mystical vein, or who summarize teaching from the mystical traditions, express a similar standpoint. K Ramakrishna Rao takes a second, somewhat different approach in his chapter, looking at the differences between mystical and rational perspectives. In the course of his conceptual analysis of consciousness, he finds sharp differences between Eastern and Western approaches. In the end of his analysis, however, Dr. Rao accepts a "complementarity" of East and West, a complementarity of logical and intuitive or mystical approaches. A third paradigm is represented by Rajiv Malhotra, who among the authors draws, perhaps, the sharpest contrasts between East and West. Malhotra gives voice to the Indic viewpoint as raising a series of "challenges" to Western

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approaches to the science-religion dialogue. By focusing on the (sometimes sharp) contrasts between East and West, Malhotra emphasizes the dangers of what he calls "history centrism" and "My-Theism", criticizing these Western tendencies in light of insights drawn from the Indic traditions.

Interestingly, these same three options - unity, complementarity, and incompatibility - can been seen to characterise not only the East-West relation, but also the relation between science and spirituality more generally. C S Unnikrishnan defends the unity hypothesis. Thus, he looks for the possibility of "spiritual experience within the process of rational scientific inquiry". And he concludes by noting how "rational critical enquiry within the domain of science itself can be a potential source of personal as well as collective realisations akin to spiritual experience". Swami Bodhananda Sarasvati seems to hold a similar position when he writes, "We believe that science and whatever it deals with - the objective world - and spirituality - the subjective world - are two aspects of the same phenomenon", just as paravidya and aparavidya "are considered to be two aspects of the same phenomenon". The second option, complementarity, is most prominently represented by Nobel laureate Charles Townes, who describes a series of ways in which science and religion serve similar functions without becoming identical. The complementarity view is also explicitly defended by D K Karthikeyan and implicitly by a number of other authors. The author who takes the strongest stand for the third option, the incompatibility of science and spirituality, is Vidyanand Nanjundaiah. In his view, only the pursuit of scientific explanations is rational. Thus, Nanjundaiah speaks dismissively of prayer along with "any other similarly irrational exercise", and he explicitly links religion with superstition and "primitive" cultures.

Science's different discussion partners

It is not the place of an overview to attempt to resolve the dispute between these three options, though in other contexts I have offered some suggestions toward a resolution.² It is interesting, however, to note how what this book's authors have to say on science and spirituality parallels, what they have to say on the relations between Eastern and Western thought. One would hope for the opportunity to explore these parallels more fully at future conferences.

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The next question that arises is, are the results different depending on what one compares science to? I suggest that the contrasts are sharpest when one considers science and religion, less sharp when one looks at science and spirituality, and least sharp when one considers science and "the Beyond".

Whatever else they are, religions are *also* institutions involving persons and practices. Clearly, no religious institution is identical to the institution of science; science has its distinctive participants, practices, disciplines and theories, educational system, meetings, and formal publications.³ Viewed institutionally, the two confront us with rather distinct worlds. Moreover, the various institutionalized religions have *different* stances toward science. Many of them have traditionally been hostile to science (this is, of course, less true of the classic Indic traditions), and some have been engaged in outright intellectual warfare with science. It may well be that some bridges can be built between religion and science, and some sort of complementarity can be established. But, as the metaphor itself suggests, this must be a bridging between two distinct land masses – the *creation* of a complementarity which is not primordially given.

The matter is different when it comes to the second sort of discussion, science and spirituality. Here the two distinct sets of practices may be experienced as one in a deeper sense. Thus, the Indian physicist, George Sudarshan, writes, "In the Hindu tradition ... the spiritual quest is in fact not distinct from the scientific, aesthetic or, for that matter, any academic pursuit". He adds, "In my own life, I have been privileged to experience the joy and ecstasy of discovery in both the scientific and spiritual domains. In such moments, the distinction between scientific and spiritual paths vanishes for me. In fact, the feeling is identical for both". To support this view, Sudarshan appeals to a set of spiritual beliefs and practices:

"The Hinduism of Central and South Asia believes instead that God manifests Himself, or Herself, in many ways and in many contexts. My tradition affirms that any spiritual search, whether academic or not, is bound to lead to God. Within Hinduism, there is nothing which is not sacred. God is not an isolated event, something separate from the universe. God is the universe".⁴

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This same standpoint is voiced by a number of authors in this book. The human scientific quest and the human spiritual quest can admittedly be defined as separate, and they often manifest themselves in separate sorts of activities that use different tools and methods. *But they are not at heart different*. The point of cooperative projects like the present volume is to begin with the separateness of these two activities, and then to show that, at a more fundamental level, they can be seen as complementary. The one quest needs the other, and together they offer deeper insights than either one could on its own.

This brings us to the third discussion. The relationship between science and "the Beyond" is even more intimate. Science and spirituality begin as different, although one may *come to see* their complementarity. But science and the Beyond are intrinsically linked to each other from the outset. As Sundar Sarukkai writes, "Science may want to have an unfettered, infinite horizon, but at any given moment there is some sense of a boundary beyond which science is not able to intervene, describe or articulate".

That human activity which we call science always involves the attempt to extend the domain of what we know. Science just is the activity of chipping away at the Beyond. Were there no Beyond, there would be no scientific activity: if a god had given humans all knowledge and all enlightenment, science would never have been born. Nor is there a danger that science will ever absorb, and hence abolish. the Beyond. The 20th century represented one extended lesson in the truth that the more humans know, the more remains to be known. From Godel's Incompleteness theorem, to the measurement problem (the collapse of the wave function) in quantum mechanics, to the challenges of relativity theory, to the singularities of the Big Bang and black holes, to the discovery of "dark matter" and "dark energy", to the study of consciousness and its neural correlates - over and over again scientists have found that, even as they dramatically push forward the frontiers of knowledge, they faced ever deepening mysteries. The relationship of science and what currently (or forever) lies beyond science is not external or extrinsic; it is as intimate as body and soul, bone and marrow. As Sangeetha Menon has perceptively noted, "Perhaps it is important to see the beyond as something beside What we consider as 'beyondness', perhaps, is not something which exists in a hierarchical order but ... which actually co-exists".

Three different perspectives, three different results. Relating science and religion means relating a series of beliefs and practices with an eye toward their institutional context and their rational grounding. Many differences arise here, even if "incompatibility" is too strong a word. Relating science and spirituality means relating two different quests of the human spirit. Here one can make a stronger case for the fundamental unity that binds the two activities together as diverse aspects of a single, deeper quest. It would be very difficult to show that the scientific and spiritual quests are inherently incompatible. Finally, relating science and the Beyond, unlike the first two comparisons, does not mean bridging two different institutions or finding similarities between two initially different types of activity. Instead, it involves pointing out two co-dependent aspects of a single activity or quest. To pursue science is to recognize that we have partially domesticated the Beyond, while being forced to humility before that which, forever Beyond, will forever elude our grasp.

Sundar Sarukkai asks, "How do we recognise the boundary of the infinite?" Presumably he presents a koan rather than the outlines of a philosophical project. As the great German philosopher G. W. F. Hegel showed, only a "bad infinite" would exclude anything - even the finite itself ! - from its presence. For an infinite that excludes the finite is not truly infinite; it is limited by that which still lies outside of it. The "truly infinite" (das wahrhaft Unendliche) is that infinite which includes all finites within it, for it alone is limited by nothing whatsoever outside itself. This insight holds also for the Beyond. The Beyond, in the deepest sense which pertains to both science and spirituality, is not the Transcendent, the Totally Other. It is that which we know because we are contained within it (in this sense, we are it), even while it forever eludes our quest to know and understand. Looked at one way, the Beyond is that which always accompanies the scientific quest, gives rise to it, guides it. Looked at another way, the Beyond represents the spiritual dimension in any human activity. For it is spiritual persons who know themselves as a part of the Beyond while always understanding - much more deeply than the others around them — that the Beyond is much deeper and more profound than anything they will ever fully grasp or comprehend. To know oneself as part of the Beyond is Grace; to know reality as always (in part) Beyond is the source of all humility.

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With these distinctions and reflections in place, we can now pose the unsettling but unavoidable question: Should one come to different conclusions about the relationship between science and spirituality depending on whether one is considering the Eastern religiousphilosophical traditions or the Western religious-philosophical traditions?

Clearly, there are a number of respects in which the Western religious traditions can be made compatible with contemporary science. I list just three. One can argue, as present-day Thomists do⁵, that scientific explanations merely provide humanity with an account of the network of "secondary causes". Yet, alongside every secondary cause is a primary cause, which is God; and no event ever takes place without the action of this divine cause underlying the chain of mundane, physical cause. Second, one can argue that the world of natural causes, as we know it, is bracketed by a divine Source and a divine Telos. No natural science can extend its knowledge beyond the singularity that lies at the beginning of this physical universe, and no scientist can extrapolate beyond the singularity (if there should be one) at the end of this universe. Hence, no scientist can rule out an essential role for a divine Creator nor the possibility of a final consummation of history brought about by its divine Telos. Finally, one can argue, as do the "process theologians" in the tradition of A N. Whitehead⁶, that every entity and every moment in the history of the universe is actually a perceiving agent, a discrete unit of experience. What natural science can comprehend only as electrons, cells, or organisms are really "actual occasions" which experience (or "prehend") the world and form their own unique syntheses of their experiences. And if the world is pervasively conscious (or at least aware) in this sense, then it is possible that the divine influence has an effect on each moment of experience, offering its initial "aim" or "lure" in the direction of the divine nature and values. Science cannot falsify any of these three claims (or the dozens of others one finds in the Western philosophical literature); hence, Western religion is not obviously incompatible with science.

Admittedly, then it is *possible* to reconcile Western theism with contemporary science. Nevertheless, I think it is true that the task is harder, the stretch is longer, and the costs are greater for the Western traditions than for (most of) the Eastern ones. After all, theism, at least in its most common forms, represents a *supernatural* metaphysic. Even

liberal Christian theologians will generally admit that, at the end of the day, theirs is a theologically dualistic position: on the one hand, there is the finite natural world; on the other, there is its infinite, eternal Creator. Few Indic traditions are dualistic in this sense, and the dualistic traditions that exist are generally formulated in a less radical fashion. (Of course, it does not follow from the fact that traditional Western theism is harder to reconcile with science that it is false).

The point leads to an important insight. All non-dualisms share something fundamental in common: all assert that the dualisms in which humans are imprisoned (whatever they may be) are not ultimately real; in the end, dualities of all stripes are left behind in the experience of non-dual reality. By contrast, there are many ways in which one can be a dualist — in fact, as many ways as there are ways of describing the distinctions within reality (and this is a very large number!). Among this wealth of dualisms, some are more radically dualistic and others less so. It is more radically dualistic to set an infinite personal God over against a finite, contingent world than it is to distinguish between finite objects and their ultimate Ground. After all, the ground is a part of that which it grounds; it is not separate from, but represents what is most essential or basic to, an object. Most of the Indic traditions which resist Advaita and which affirm the existence of a personal god (Isvara) are less radically dualistic than (many versions of) Western theism. For example, it is standard to attribute certain impersonal qualities to the personal god.

Since (roughly) 1800, but with increasing urgency in recent decades, Western theologians have begun to reconceive theism in the direction of ultimate Ground or all-inclusive infinity. The view is most often presented under the heading of *panentheism*, the view that the world exists within the Divine, although God is also more than the world. On this approach, the world does not exist outside of God; rather the Divine is the One "in whom we live and move and have our being" (St. Paul in Acts 17:28).⁷ God is viewed not as a separate personal being standing over against the world, but as the Ground of Being that exists "in, with and under" all things in the world. Although, something of God transcends the finite world as a whole, the physical world in its lawfulness is still a manifestation of the divine agency. Those familiar with the Indic traditions will recognize the great debt that panentheistic theologians owe to Vedantic philosophy in reformulating the Western traditions in this manner. A theism understood within the context of panentheism is somewhat easier to reconcile with modern science than is classical Western theism.

Up to this point, we have been focusing on religious understandings of reality, trying to assess which are easier and which are harder to reconcile with contemporary science. But this volume is much broader than metaphysics alone; many of the authors are concerned with personal, ethical and applied issues. To do justice to the full panoply of chapters requires a more subtle set of categories than merely "Eastern versus Western" or "theistic versus non-dualist metaphysics". In closing, then, let us then expand our typology to include as many as possible of the contributions included in this volume. I list them in order of the difficulty of reconciling them with contemporary science, from hardest to easiest:

(1) Classical Western personalist theism. God stands outside the natural order and creates it out of nothing (*ex nihilo*). Yet, He also occasionally intervenes into the created order to bring about His purposes. Miracles — God's suspending natural law to directly bring about desired outcomes in the world — are possible.⁸

(2) The Ground of the empirical or perceived world. The world as ordinary persons perceive it, or as science measures it, is not the ultimate level of reality. Underlying the world of appearances is its divine Ground. Authors differ in how they describe this Ground, and some hold that it cannot be described at all. In the Western traditions, it is often spoken of as Being Itself; in Vedantic traditions, it is described as Consciousness or *Brahman*. Positions of this type do not deny the reality of empirical things; but they do maintain that the ultimate essence or ground or reality of these things lies at this deeper level of reality.⁹

(3) Aspects of natural reality unknown to science. Views of this type do not commit themselves to an ultimate metaphysical theory of any type. But they do insist that there are dimensions to this natural world that we inhabit which science has not yet grasped. For example, it is widely believed that practiced yogis are able to sense connections, perceive dimensions, and exercise powers that most people do not know about and science has not yet grasped. As a sign of the compatibility of this view with science, practitioners and their followers often call for a more thorough scientific examination of the most honoured yogis, their brain states, their breathing rate, their causal powers, and other physiological features. Now these claims about the capacities that humans can potentially exercise are not identical with

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scientific conclusions, yet, nor do they represent metaphysical assertions that contradict science. According to the adherents, scientists may some day be able at least to verify the existence of such powers, even if they cannot understand them.

(4) A dimension of significance to the natural world. For some of the authors, spirituality does not require belief in any special powers or special metaphysical entities. It means only that people can come to experience, perhaps through meditation, a sense of unity within themselves, a sense of the significance of all things, or a sense of the connectedness of their lives within the whole of the natural order. Even a strict naturalist such as E O Wilson is willing to grant such feelings of significance, since they do not necessarily make any knowledge claims about reality that go beyond or contradict science.¹⁰ Of course, if one draws metaphysical conclusions from the feeling of significance, then one steps outside of this view. But many find a "reconciliation" between spirituality and science to lie in this more humble, yet still significant, inner spiritual response to the world as it exists and as science reveals it to us.

(5) The attempt to live ethically or to make the world a better place. Those who formulate a set of fundamental values and who are actively involved in attempting to live out those values in the world are in a similar position to those in the preceding category. For nothing in science denies that humans have beliefs about right and wrong, that they seek to live according to those values, or that they work to transform the world according to their vision of how things ought to be. Of course, if one holds that Good and Evil are built into the very fabric of the universe, then one has made a metaphysical claim similar to those made in the first two positions listed above. For example, those who hold that the world is really determined by karmic forces espouse a metaphysical view of this sort. But those who quietly --- or boldly --live by certain self-chosen values need not experience any conflict with science. Nor does the situation change if one chooses to use metaphors drawn from sacred scriptures or from the world's religious traditions in describing his fundamental values. It is only when one takes these religious terms and stories as literally true of the world - that is, when one interprets them metaphysically --- that one faces resistance from scientists. No such resistance is raised by using religious metaphors that help one to describe the values he or she holds. (Of course, again, the fact that a metaphysical theory of values is harder to reconcile with science does not make it false).

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Should we group Western discussions of science and "the Beyond" at the top of this list and Eastern discussions toward the bottom? I admit that I began my seven-year involvement with SSO with something like this common stereotype of East and West. Eastern philosophies, I had been taught, would always affirm the unity behind diverse conceptual approaches, including the ultimate unity of science and philosophy or spirituality; Western religious philosophies, I believed, would struggle continually with the dualism of supernatural God and natural world, either rejecting one pole or holding the two in an uneasy tension. Behind these stereotypes, it turned out, are both truth and falsehood. As this volume reveals, the range of viewpoints among scholars of the Indic traditions is far greater than the stereotype suggests: some advocate mystical unity and downplay the status of science, whereas others encourage a more hard-minded scientific approach to the detriment of "primitive" religious philosophies. Still, in contrast to our conferences elsewhere in the world, the meetings in Bangalore conveyed a greater confidence in the possibility of finding an overarching unitary standpoint, a perspective from which the tensions between science and "the Beyond" would fall away. Where tensions did remain in the Bangalore discussions, they were gentler and less pronounced than in any of the other countries in which SSQ events were held. By contrast, Western thinkers do struggle with a deeper dualism. What was most encouraging over these last years, however, was to see how new schools of thought in the West (e.g., panentheism, religious naturalism) — often under the influence of Indian thinkers have made major progress toward overcoming the sharp dualisms that once characterized Western thought.

Conclusion

As I noted in the closing words of the Science and the Spiritual Quest programme, speaking to the massive gathering at the Karnataka State Tennis Stadium in Bangalore in January 2003, it is fitting that Science and the Spiritual Quest would end in India and that it would culminate in a dialogue between the Indic traditions and science. Vedantic religious practices, and the belief system that grew up alongside them, represent some of the most ancient organized forms of spiritual practice in the history of civilization. As philosophers around the world know, they have also given birth to some of the most sophisticated philosophical reflection on the nature of ultimate reality ever to have been written. That the present collection should bring the Indic

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traditions into dialogue with Western religious-philosophical traditions, and should do this in the context of the current renaissance of discussion between science and spirituality, can only underscore one's sense of the continuing importance of the Indic traditions for today's world.

Those who grasp the pluralism of the Indic philosophical traditions will not be surprised that, when it comes to the end, among the contributions to this volume, no simple unity can be discerned. Inevitably, the results of our enquiry will be diverse, open-ended, and hypothetical. Discerning readers will discern with their intuition and with their hearts the deep commonalities which bind together the authors in this volume, tying their work together into a common statement on this crucial theme. Yet, as soon as any one attempts to formulate that fundamental unity, his voice immediately becomes just one more perspective among the others. It is appropriate, then, to conclude by gesturing with appreciation toward the gentle unity of spirit which permeates most of the contributions to this volume. As one of our Western mystics has said, "It is only with the heart that one can see rightly. What is essential is invisible to the eye" (Voici mon secret. Il est très simple: on ne voit bien qu'avec le coeur. L'essentiel est invisible pour les veux)".¹¹

End Notes

- 1. I am grateful to the volume's other editors for constructive comments and criticisms of an earlier draft of this Overview, which have helped to increase the clarity and accuracy of the final product.
- 2. See Clayton, *God and Contemporary Science* (Grand Rapids, Michigan: Eerdmans Publishing House, 1997).
- 3. See T. S. Kuhn, *The Essential Tension: Selected Studies in Scientific Tradition and Change* (Chicago: University of Chicago Press, 1977).
- 4. See George Sudarshan, "One Quest, One Knowledge", in W. Mark Richardson et al., eds., Science and the Spiritual Quest: New Essays by Leading Scientists (London: Routledge, 2002), pp. 250, 251, 252.
- 5. See especially Austin Farrer, *Finite and Infinite: A Philosophical Essay* (Westminster [London]: Dacre Press, 1943). "Thomists" are those who stand in the tradition of the 13th century Catholic Theologian, Thomas Aquinas.
- See A N Whitehead, Process and Reality, Corrected Edition (New York: Free Press, 1978). For an excellent recent example see David Ray Griffin, Reenchantment without Supernaturalism: A Process Philosophy of Religion (Cornell University Press, 2001).

Philip Clayton

- 7. For a recent collection on this topic, see Philip Clayton and Arthur Peacocke, eds., In Whom We Live and Move and Have Our Being: Panentheistic Reflections on God's Presence in a Scientific World (Grand Rapids: Eerdmans, 2004).
- 8. Thomas Aquinas, Summa contra Gentiles, Book III, QQ. 100-103.
- 9. One would at first think that non-dualist positions positions which assert that the world of empirical experience does not really exist are harder to reconcile with science than positions of type (2). But I do not think this conclusion is accurate. Science can stand unchallenged in its ability to make predictions about the so-called world of ordinary experience; it's just that the non-dualist holds that the "world", which science so well explains, is in the end illusory. Since this is a metaphysical (or mystical or spiritual) claim, it does not need to contradict science as we know it any more than do positions of type (2).
- See E O Wilson, Concilience: The Unity of Knowledge (New York: Knopf, 1998).
- 11. Antoine-Marie-Roger de Saint-Exupery, *The Little Prince* (San Diego: Harcourt, 2000).

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If there is something beyond science, what is it – for each of us, and for mankind as a whole? It is questions of this nature that were addressed by a galaxy of the most distinguished scientists and scholars, from India and abroad, during a four day international symposium at the National Institute of Advanced Studies, Bangalore (8-11 January 2003), entitled Science and Beyond: Cosmology, Consciousness and Technology in the Indic Traditions. This volume is a collection of papers presented at the Symposium. Taken together, these papers give new insights into the intricate bond between science and the spiritual quest.

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Picture on the cover

Mathematics and Beyond? A magic square next to a celestial yaksi on the door-jamb of a temple to Pārsva-nātha in the Jain complex at Khajuraho, the celebrated capital of the Chandella Kings (9th-13th c.) in today's Madhya Pradesh. (The numbers in the magic square add up to 34 along rows, columns and diagonals.)

| 7 | 12 | 1 | 14 |
|----|----|----|----|
| 2 | 13 | 8 | 11 |
| 16 | 3 | 10 | 5 |
| 9 | 6 | 15 | 4 |

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