SCIENCE AND RELIGION: APPROACH TOWARDS A SYNTHESIS

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It is indeed a great honour to be invited to speak at the Creeds of Our Times, a lecture series organized by the Foundation of Universal Responsibility of His Holiness the Dalai Lama. As we progress towards the next millennium, we do need to critically examine the various faiths and creeds that have guided us till now. Today's conditions and environment are considerably different from the times when most of these creeds

took root. How do they stand up to the present times? What valuable guidance do they have to offer today, guidance that is based on centuries of experience? Do they need to be modified in view of the rapidly changing social scenario of the present and the future?

I chose to talk on science and religion because science has been the main driving force behind the present changes in society and is likely to continue being so in the foreseeable future. In thinking about creeds for the new millennium we cannot afford to ignore science.

At the outset, I confess that I feel diffident in expressing my views before this august audience, knowing that this talk will ultimately appear in a collection of articles by distinguished scholars. It is diffidence born out of the realization that I do not possess the intellectual maturity to speak authoritatively on the topic I have chosen. What I have to say, therefore, arises from the many questions I have in my mind, questions that I do not have answers to. As a student of science, I have progressed far enough to realize how little I know of it and how limited its present expanse is. About religion I am even more illiterate! So I find shelter behind the quotes of one of the greatest intellects of this century.

Writing about science and religion in the celebrated scientific journal *Nature*, Albert Einstein had this to say:

> *"It would not be difficult to come to an agreement as to what we understand by science. Science is the century-old endeavour to bring together by means of systematic thought the per-*

ceptible phenomena of this world into as thorough-going an association as possible. To put it boldly, it is the attempt at the posterior reconstruction of existence by the process of conceptualization. But when asking myself what religion is, I cannot think of the answer so easily. Even after finding an answer which may satisfy me at this particular moment, I still remain convinced that I can never in any circumstances bring together, even to a slight extent, all those who have given this question serious consideration...."

[Nature, November 9, 1940, vol. 146, p.605]

Einstein said this in 1940 on the occasion of a conference on science, philosophy and religion held at the Jewish Theological Seminary of America in New York.

Einstein's difficulty is felt by most scientists and I will have occasion to say something about it. Why then attempt to bring about a synthesis in a confrontation wherein at least on one side there is a divergence of views?

Why I think such an attempt is worthwhile is because despite the divergence of religious views, and different perceptions and methodologies of science and religion, both represent human efforts to understand existence and the natural environment that sustains it. If we set aside the mundane details of scientific experimentation on the one hand and religious rituals on the other and concentrate on the intellectual aspirations on both sides then there may exist considerable common ground for their co-existence. I hope to express some thoughts in this direction.

However, while I do so I should express a disclaimer. Einstein was not alone in expressing his views on science and religion... many great minds have written and talked on the theme. While I attempt to tread on their footprints, I am conscious of what Kalidasa, the great Sanskrit poet and dramatist had to say at the beginning of his *Raghuvansa*:

> *mandah kaviyasaprarthi*
> *gamisyamupahasyatam*
> *pransulabhye phale mohadudbahuriva*
> *vamanah*
>
> Being dim-witted but aspiring for the success of the learned, I will end up in ridicule, like a dwarf raising his hands towards a fruit that can be reached only by a tall person.
>
> *[Raghuvansam, Sarga 1, sloka 3]*

But having written these lines, Kalidasa went on to produce the masterpiece of *Raghuvansa*. While I subscribe to Kalidas's sentiments, I hold out no such hope! This is my disclaimer!

Man and the Universe

I begin by reviewing our present understanding of the cosmos, an understanding that has grown considerably over the last few decades, but which cannot be considered in any way complete. I do so because the subject of cosmology, which deals with the origin and evolution of the universe, tells us how small man is, how limited his experience on this tiny planet is in comparison with the physical universe he can observe.

Here, on Earth, we are dependent on the Sun to give us energy to sustain life. Apparently the brightest

object in the sky, the Sun is fortunately reasonably far away from us so that we are spared the enormous heat it generates. In terms of the distance units used by us here in daily life, the Sun's distance is some hundred and fifty million kilometres, or as much as light covers in about five hundred seconds.

But astronomy teaches us that the Sun is literally at our doorsteps compared to the stars we see in the night sky. The nearest of them, Proxima Centauri is located about four and a quarter light years from us. That is, light from Proxima Centauri takes four and a quarter years to reach us, far more than the five hundred seconds taken by sunlight. No wonder that the stars viewed from such vast distances look so faint. In fact, in the stellar world, the Sun can boast of no particular distinction! It is neither the brightest nor the biggest star. It is very ordinary, so far as luminosity and size go.

These stars that we see are but a very tiny fraction of the more than hundred billion stars that reside in our Milky Way galaxy. The Milky Way itself is like a disc with a diameter of a hundred thousand light years. Till the early part of this century, the human ego generated a firm belief that our galaxy is the only object in the universe; that is everything that the astronomer discovered through his telescopes was believed to belong to the Milky Way.

This belief was rudely shattered in the 1920s with the realization that many of the faint nebulous patches appearing on astronomical photographs were galaxies in their own right, of size comparable to the Milky Way. And they were located at distances of millions of light years. Today, telescopes like the Hubble

Space Telescope or the large ground-based telescopes like the Keck Telescope are showing us a universe even grander than this. It is made of clusters of galaxies grouped in large superclusters hundred million light years across or even larger, separated by giant voids, with the entire structure expanding in a very systematic way. Looking as far as ten billion light years, these telescopes continue to see no end to the universal expanse.

What caused this expansion? How did galaxies appear in their clusters and superclusters? Indeed, how did particles that comprise basic constituents of matter first form? We see the universe bathed in a radiation background of very low temperature; what was its origin due to?

These are questions posed by today's cosmologists. They are different from those of yesteryear, of the last century when astronomy hardly reached beyond the confines of the Milky Way. Have we reached the end of the quest, or does something lie beyond it? These questions and the enormity of the universe in comparison with the human habitat here on the Earth, have had a humbling influence on some of the greatest scientific brains of this century.

To quote the British cosmologist and Plumian Professor at Cambridge, A.S. Eddington:

> *"Man in his search for knowledge of the universe is like a potato bug in a potato in the hold of a ship trying to fathom from the ship's motion the nature of the vast sea...."*

Eddington said this more than five decades ago. In 1970, Fred Hoyle, another astronomer who occu-

pied the same Plumian Professor's chair at Cambridge, had this to say:

> *"I think it is very unlikely that a creature evolving on this planet the human being, is likely to possess a brain that is fully capable of understanding physics in its totality. I think this is inherently improbable in the first place, but even if it should be so, it is surely wildly improbable that this situation should just have been reached on the year 1970..."*

I have given these details to establish the frame of reference from which I, a cosmologist by training, view today's topic. Perhaps I should also say something about my local environment and heritage which directly or indirectly have influenced my thinking.

I come from Maharashtra which recently celebrated the seventh centenary of Sant Jnaneshwara, whose works have continued to influence and guide people through their practical and pragmatic philosophy. For, in those works and through his discourses, Jnaneshwara had emphasized the note of tolerance between the many approaches in search of the universal truth. In those seven hundred years science has made remarkable progress. It's powers, both benign and destructive, are abundantly clear today as are its numerous influences on society. Many therefore see it as a challenger to established religions.

I should also mention that I have been influenced by the pragmatic philosophy of Karma Yoga in the Gita, where towards the end Lord Krishna says:

> *vimrsyetadasesen, yatheccchasi tatha kuru*
>
> *Think over it exhaustively and then do as you please.*
>
> *[Gita, Chapter XVIII, sloka 63]*

This is what scientific temper is all about!

Today, I wish to highlight aspects of the science vs. religion debate from my own somewhat narrow but pragmatic vantage point...

Common Goals

Both science and religion are guided by man's search for the truth. Their approaches are different, even their concepts of what they mean by 'truth' are different. Let us consider science first.

Science as a subject took shape out of man's curiosity about nature, about the various natural events going on around him, about the sun, the moon, the stars and planets, about lightning and thunder, about the living things great and small and about the origin of the universe. Although it took several centuries for the scientific method to get established; once it did take shape, it spread fast.

Experiment, observation, theory and predictions... the last to be tested by more experiments. And so the chain goes on. From a certain level of understanding of nature the scientist asks further questions. From his efforts to find their answers he advances to a higher level and there new questions await him which he could not have even thought of earlier.

Take an example about atomic structure. Why does the atom of hydrogen have the size of a fraction of a nanometre? This question could be understood and answered by the quantum physicists of this century. In Issac Newton's time this question would not have made sense at all. Likewise when in the 1920s, Eddington conjectured that the origin of the sun's energy lies in

the nuclear fusion process, he was ridiculed by nuclear physicists. Within a decade and a half, the science of the nucleus had advanced to a stage where Eddington was proved right.

Planet, star, galaxy, cluster, supercluster... the picture of this hierarchical structure in the universe had been resisted at each level by the scientific establishment: a minority had argued for the next stage in the ladder but were overruled. However, in the last analysis, the minority view was vindicated as scientific decisions are ultimately determined by facts and not by a majority vote.

And so science goes on bettering its knowledge base and looking for facts at more and more sophisticated levels. The process is seemingly an endless one. But, so far, it seems unable to grapple with questions relating to the interior of the human mind, the feelings, the emotions and the urge to know which gave rise to it. Why is man created? Why are so many living species of different sorts in existence? What is the purpose of this creation? Why are there laws of science in the first place? Why do the laws discovered by man on this tiny Earth seem to work on the much grander scales of stars and galaxies?

These questions about cosmic truth seem beyond the scope of science. This is where religion steps in. Different religions have provided different thought structures to answer such questions. Even the role of the Creator, or God, assumes different proportions in different contexts. There are hierarchies in attempts to attain knowledge via religion, too. In the Gita, for example, Krishna tells Arjuna:

sreyo hi jnanamabhyasat jnanat dhyanam visisyate
dhyanatkarmaphalatyagas
tyagaccgabturababtaram

Better indeed is knowledge than the practice (of concentration), better than knowledge is meditation, better than meditation is renunciation of the fruit of action; on renunciation (follows) immediate peace.

[Gita, Chapter XII, sloka 12]

In all religions there is an ultimate state of perfection that the individual may aspire to. This may be *Moksha* or Nirvana, or some other form. This state is one where basically all questions are answered and there is no need to ask any more.

In a sense, science would also like to reach that state but it is very unlikely that it ever will. Indeed, in contrast to the religious seeker who attains peace and contentment at the conclusion of his search with the above goal, the scientist may find the universe a very dull and boring place to live in if all his questions were answered.

Different Approaches

The scientific truth is, however, very different from the religious one even when both are incomplete. Science insists on objectivity, on the repeatability of its experiments, on their validity on a universal scale. Thus, if the claims of Mr. X cannot be experimentally or observationally confirmed by Mr Y, Mr Z, etc., they are viewed with scepticism. If Galileo found that the speed of a stone dropped from the Leaning Tower of

Pisa grew in proportion to time after dropping, the same result would have to be obtained by anybody performing the same experiment.

But with religious experiences it is a different story. When Krishna showed Arjuna his 'Universal Form' he told him:

Na vedayajnadhyanairna danairna ca kriya-
bhirna tapobhirugraih
Evam rupah sakya aham nrloke drastum
tvadanyen kurupravir

Neither by the Vedas, (nor by) sacrifices nor by study nor by gifts nor by ceremonial rites nor by severe austerities can I with this form be seen in the world of men by anyone else but thee, O hero of the Kurus!

[Gita, Chapter XI, sloka 48]

Thus, only Arjuna was privileged to see the Universal Form. No scientist can similarly get away by saying, "Only I have seen the proton decay... others cannot see it happen."

This is the main contrast between science and religion, in their perception of truth: the objectivity insisted on by science versus the highly subjective personal experiences of the religious. The conflicts arise when scientists are asked to believe these unique personal experiences of the select few. They obviously cannot believe what they cannot themselves experience. On the other hand, a deeply religious follower of a seer who has had that experience, sincerely believes that the experience is real. Indeed, he may consider the scientist obdurate in his disbelief.

Secondly, the scientist, aware of the partial truths he has established, knows the difficulty of reaching the goal of complete knowledge. Most religions tell him, on the other hand, that they have the complete knowledge... again based on the experiences of the select few. This tone of certainty makes the scientist uncomfortable with the claim.

These differences are genuine and must be appreciated and respected on both sides in a science vs religion debate. There are, however, other issues which I will discuss now, issues that complicate the matter further.

Most religions of the world started off as or evolved into moral codes of conduct which are essential for a collection of human beings to live together as a society. Thus, there are inevitably several do's and don'ts. For example, there are the Ten Commandments in the Bible. Moreover, the religions also evolved their methods of providing peace to a human mind, often to face the stress of living. These methods also prescribed do's and don'ts to shape human thinking.

Nevertheless, problems arose when these sincere and practical instructions got mixed up with rituals, so much so, that the latter eventually superceded the former. At some stage, astrology also got into the game with the 'evil planets' having to be propitiated. Then there were the injections of miracles which continue to this day. It is as if the teacher cannot establish his credentials through his/her wisdom but must resort to tricks to command respect of those to be converted. When these miracles of modern times are debunked by scientific scrutiny, when astrological predictive apparatus is demonstrated to be ineffective and non-

scientific it is not surprising that the scientists develop an antipathy towards religion regarding it as a vehicle for such superstitions.

Just as these pseudo-religious practices bring a bad name to religion, so does fanaticism which today goes under the name of fundamentalism. Fundamentalism precludes any questioning of the tenets and, hence, is totally contrary to the scientific outlook. Moreover, religious fundamentalism finds scientific facts unpalatable and, therefore, resists them and resists science itself.

Having passed these critical remarks on the present religious ambience, let me hasten to add that the slate is not clean on the scientific side either. It is a measure of the social pressures on scientists that, nowadays, one notices a dimming of the objectivity that is the hallmark of science and one also sees the emergence of what I call scientific fundamentalism. Copernicus and Galileo suffered from this fundamentalism when they tried to propose the heliocentric theory as an alternative to the geocentric theory. One could complacently argue that the fundamentalism they encountered was of a religious nature. This argument is only partly true. For, even intellectuals not belonging to the Catholic clergy opposed the heliocentric theory.... and on the Protestant side Martin Luther was not friendly to it either. One may say that for fear of losing prestige and secure positions, the intellectuals of the sixteenth and the early seventeenth centuries were reluctant to take public positions in favour of the heliocentric theory. Let us now see the modern compulsions that drive present-day science.

Today, scientists have come to rely increasingly on public funding for their research. So they have

evolved a supposedly fair and democratic way of deciding which projects to fund. The method is based on peer review but it works in a very conservative manner. Only those projects are funded which are 'safe', i.e., where the idea has been proven to be workable, or at least acceptable to a large majority. While this seems a reasonable way of disbursing public money, it totally discourages new ideas and new developments in science. All moderately good scientific discoveries would fall within the above scheme, but the information net is such that radically new ideas would slip through it. And a look at the history of science is enough to convince any reviewer that it is the latter that have maintained the vitality of scientific progress. In this connection I may quote the story told by Eddington:

> *"...In ancient days two aviators procured to themselves wings. Daedalus flew safely through the middle air and was duly honoured on his landing. Icarus soared upwards to the sun till the wax melted which bound his wings and his flight ended in fiasco... The classical authorities tell us, of course, that he was only "doing a stunt"; but prefer to think of him as the man who brought to light a serious constructional defect in the flying-machines of his day."*

So, too, in science, Cautious Daedalus will apply his theories where he feels confident they will safely go; but by his excess of caution their hidden weaknesses remain undiscovered. Icarus will strain his theories to the breaking-point till the weak joints gape. For the mere adventure? Perhaps partly, that is human nature. But if he is destined not yet to reach the Sun

and solve finally the riddle of its construction, we may at least hope to learn from his journey some hints to build a better machine...

Perhaps carried away by the conformism, many distinguished scientists often delude themselves that their 'tried and proven path' represents the real and ultimate facts about the universe, so much so, that the end of their quest is near. In fact, the reverse is true: a feeling of complacency is an indication that the tried and proven method has reached the end of its usefulness and something very different is needed. A hundred years ago, the rapid advances of gravitation theory, electromagnetic theory and thermodynamics led many scientists to believe that the 'End of Physics' was reached. These prophesies were belied by two major revolutions of this century, viz., the theory of relativity and the quantum theory: both these inputs came during the first two decades of the present century. It is interesting to see history repeat itself with a scientist of the stature of Stephen Hawking saying in 1980 that the End of Physics is round the corner. That corner already seems to be receding.

Thus, given these departures from the cherished image of science, the discerning layman is justified in questioning the infallibility of science and the wisdom of putting all one's intellectual eggs in the scientific basket.

The Concept of God

Scientists are often asked if they believe in 'God'. Now the notion of 'God' is so variable from person to person that an answer of the yes/no type will be grossly misleading. Is the scientist expected to 'prove'

the existence of God by demonstrating how well-ordered the working of the universe is? Does it help him in understanding why there are laws of science? Judged purely by scientific logic, a fresh postulate that simply justifies only what is already known is no advance in one's understanding. Surely the 'God' that the seers from different religions experienced was different from the above scientific postulate. In other words, in my opinion putting the above question to a scientist (because he is a scientist) is unfair.

Questions like "Why is the universe governed by laws of science?", or "What 'agency' decided that these and no other laws shall operate?" are beyond the scope of science. Simply postulating 'God' to answer these questions does not take us very far. But the basic faith a scientist has, that keeps him/her in business, is that there are some basic laws governing nature and the declared aim of science is to find them. Beyond that any other belief relating to "Is there God" may be answered by the scientist not in the role of a scientist but as a human being.

Replies from different scientists may differ, thus, indicating that the question cannot be answered in the objective terms such as a question like: "Do you believe in dark matter?" Let us go back to Einstein on this. In his article quoted earlier he says:

> *"Though I have asserted above, that in truth a legitimate conflict between religion and science cannot exist, I must nevertheless qualify this assertion once again on an essential point, with reference to the actual content of historical religions. This qualification has to do with the concept of God. During the youthful period of*

mankind's spiritual evolution, human fantasy created gods in man's own image, who by the operations of their will, were supposed to determine, or at any rate to influence, the phenomenal world. Man sought to alter the disposition of these gods in his own favour by means of magic and prayer. The idea of gods in the religions taught at present is a sublimation of that old conception of gods. Its anthropomorphic character is shown, for example, by the fact that men appeal to the Divine Being in prayers and plead for the fulfillment of their wishes."

Imagine the following everyday situation: College student A does not study regularly and as the examination approaches, he realizes that he cannot get the high percentage of marks that he needs for his future career. So A goes to a temple or a *madarsa* and makes an offering to the deity or *pir* so that he may get the requisite high marks. Student B, in a similar predicament, is more down to earth. He discovers who are the examiners and goes and bribes them so that he may score high marks. Are the expectations of A about the morality of his God any different from those of B with respect to the examiners? If God or the *pir* indeed fulfills the prayers of A is He not doing injustice to student C who has worked hard and prepared well for the examination? Why should A get the same marks as C?

Einstein had objections to a 'God' of this kind. He urged:

"...In their struggle for the ethical good, teachers of religion must have the stature to give up the doctrine of a personal God, that is, give up

that source of fear and hope which in the past placed such vast power in the hands of priests..."

Instead, he hoped that religions would come forward to the aid of science as it searches further for the truth behind the regularity of the universe from the very microscopic level to the grandest level. A great deal remains to be learnt to understand the mystery behind the observed rationality of the operations of nature.

However, not everything in our experience can be reduced to regularity, symmetry, etc., of scientific information. The role of the perceiving individual cannot be altogether ignored. Another great intellect of this century, Rabindranath Tagore describes his childhood experience when he came across a rhymed sentence loosely translated, thus: 'It rains, the leaves tremble', in these words:

"At once I came to a world where I recovered my full meaning. My mind touched the creative realm of expression... The rhythmic picture of tremulous leaves beaten by the rain opened before my mind the world which does not merely carry information, but a harmony with my being. The unmeaning fragments lost their individual isolation and my mind revelled in the unity of vision. I felt sure that some Being who comprehended me and my world was seeking his best expression in all my experiences, uniting them into an ever widening individuality which was a spiritual work of art..."

These examples illustrate but by no means exhaust, the differing perspectives on the question. So,

when someone asks me the question: "As a scientist do you believe in God? Answer YES or NO", I reply: "It is too difficult a question for me to answer; and even if I tried to answer the question, it might be misleading, for you will interpret my reply within your perception of God which may be totally different from mine."

Complementarity and Synthesis

Given these difficulties that separate the reality from the ideal, what can we do to bridge the gap?

First, it is necessary to recognize that religion and science fulfill complementary urges of the human mind. The problems come when there is a trespass of the area of either one by the other. Thus, scientists should avoid passing value judgements on religious thoughts without appreciating their very different contexts. And religious thinkers should not try to look for postfacto justification of their thoughts in the findings of science.

To achieve a synthesis or, at least, a co-existence of science and religion several different steps are possible. First, the religions can be pragmatic enough to adapt their philosophies to the new facts of the universe, large and small, revealed by science. The religious concepts and beliefs must be such as to be consistent with the scientific facts. The scientists, on the other hand, must be always aware of the incompleteness of their knowledge and hence receptive to new ideas and concepts. They have the future possibility of understanding the operations of the human brain. Their researches may very well add to the philosopher's thoughts on reality, consciousness, purpose of existence, etc. But at present they don't. Nor do they rationalize in

terms of scientific experiments, the notions of aesthetics, creativity, emotions, etc. Thus, scientists should constantly remind themselves that there are at least a few concepts and experiences which their laws do not reach today, and perhaps may never reach.

In short, science and religion have much to gain by being pragmatic, by learning from each other. In this context I am reminded of the oft-quoted line from the Isavasyopanisad:

Avidyaya mrtyum tirtva vidyaya
amrtamas'nute

I don't pretend to be a vedic scholar, when I interpret this line as saying that *'avidya'* representing acts and deeds can be used to transcend death and *'vidya'* representing spiritual knowledge can help to digest the nectar of supreme happiness. Science, as part of the former, has come to regulate our lives and how we act; it needs to be supplemented by the latter which should come from our creeds.

Conclusions

At this stage, I would like to conclude with a few thoughts from Swami Vivekananda. In his Chicago address of 19 September, 1893. Swamiji said:

> *"... Science is nothing but the finding of unity. As soon as science would reach perfect unity, it would stop from further progress, because it would reach the goal. Thus chemistry would not progress further when it would discover one element out of which all others could be made. Physics would stop when it would be able to fulfill its services in discovering one energy of*

which all the others are but manifestations and the science of religion become perfect when it would discover Him who is the one life in a universe of death, Him who is the constant basis of an ever-changing world. One who is the only Soul of which all souls are but delusive manifestations. Thus is it, through multiplicity and duality, that the ultimate unity is reached. Religion can go no farther. This is the goal of all science..."

Throughout his various addresses, Swami Vivekananda emphasized this essential goal of unity of religious approaches, even if they look very different at their starting points: *'Ekam sat vipra bahudha vadanti'*. That which exists is One; sages call it by various names. He had emphasized the tolerance needed to accommodate diverse points of view if such a search for unity is to be carried out, highlighting the fact that this tolerance had always been part of the Indian tradition.

Dr S. Radhakrishnan, in his book, *Eastern Religions and Western Thought*, defined tolerance as "the homage that the finite mind pays to the inexhaustibility of the infinite". The remark profoundly expresses the importance of tolerance not only in religion and philosophy but in science also. For, I have said enough to underscore the limitations of present-day science and the need for a many-pronged approach towards the search for the ultimate truth. Scientific theories inspired by some dogma of the time ultimately reached dead-ends and could proceed no further. Theories that were pragmatic and open to a critical appraisal and revision, survived and progressed further.

To a scientist like me, this latter approach finds an echo in the teaching of Swami Vivekananda when he said in his lecture on *My Master,* in New York, in 1896:

> *"...This is the message of Sri Ramakrishna to the modern world: 'Do not care for doctrines, do no care for dogmas, or sects, or churches, or temples; they count for little compared with the essence of existence in each man, which is spirituality; and the more this is developed in a man, the more powerful is he for good. Earn that first, acquire that, and criticize no one, for all doctrines and creeds have some good in them..."*

In the strife-ridden world of today, how pertinent these words sound! This humanism is needed not only in the sphere of religion, it is equally relevant to modern science.

However, I can end this discussion no better than by drawing attention to the Pasayadan of Sant Jnaneshwara. In this invocation expressing hope for the well being of the world, the seer talked of a universal religion that transcends the narrow boundaries of space and time and of culture. It is indeed remarkable that seven centuries ago when none of today's communicative modes were available, a person could talk of a cosmic religion.