



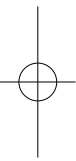
## From the Public Lecture

### Life in the Universe—Concordance with Buddhist Thought

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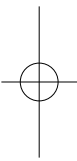
#### End of “Earth-centred philosophy”



**I**N the long history of mankind the past 100 years stands out as a shining beacon of scientific and technological achievement. At the start of this era our forebears—great-grand parents and grandparents—were just getting accustomed to the benefits of the steam engine, the internal combustion engine—the motor car—electric lights, the telephone and the telegraph. Now, a hundred years on, we live in a world that our grandparents could not have dreamed of - the bullet train, space travel, genetic engineering, television, supercomputers, iPads and iPhones, to name but a few. The world today is instantly and intimately connected in ways that could not have been imagined even as recently as a few decades ago.

One hundred years ago, in astronomy, a new generation of telescopes were beginning to reveal evidence in the form of faint nebulae that pointed to the existence of very distant galaxies outside our Milky Way. In biology the facts relating to the evolution of life throughout geological time as well as the great antiquity of the Earth itself were beginning to be grasped. Today with the help of modern techniques we are able to probe the frontiers of biology as well as astronomy. A flotilla of space telescopes are exploring ever more distant galaxies. DNA—our genetic heritage—has now been deciphered, but its interpretation is still in progress. The merging of astronomy and biology into a new discipline of astrobiology is beginning to take shape.

In this article I shall point out that discoveries, particularly those that imply a connection between life and the external cosmos, are consistent with the tenets of Buddhism. Such a connection was denied for a long time in Earth-centred Western philosophies. In 1600 AD Giordano Bruno was burnt to death for asserting that there were a multitude of



inhabited planets circling distant stars. This type of resistance to accepting extraterrestrial life exists in some degree even today, albeit in a subtle form.

An important aspect of Buddhism is that compared to other religions it is relatively free of dogma. Buddhism is a philosophy that encourages freedom of expression and initiative and exhorts one to discover truths about the world for oneself. This is epitomised in the closing stanza of the *Parinibbana sutra*, Sakyamuni Buddha's last words to his disciple:

“You should live as lamps unto yourselves.  
Hold fast to the Lamp of Truth.  
Take refuge only in Truth;  
Look not to refuge to anyone beside yourself.”

There can be no better advice that would serve to launch any graduate student of science upon a brilliant career of innovation. In this regard the Buddhism of Nichiren Daishonin and the original Buddhism of Siddhartha Gautama are entirely equivalent, and I shall make no distinction between the two. It is also noteworthy that precisely this sentiment of self-reliance has been reiterated by SGI President Daisaku Ikeda for several decades.

Six centuries ago the long process of degrading the place of our home planet in relation to the rest of the universe began. After a bitter struggle against authority, the Earth came at last to be reduced to the status of an ordinary planet orbiting an ordinary star. From the dawn of the 20th century every new discovery in astronomy has further diminished the position and importance of our own planetary abode. Now we know of course that the Earth is one of eight planets which form part of our solar system—one that includes a vast number of smaller rocky bodies and a gigantic shell of frozen comets, numbering some 100 billion, located at an average distance of a tenth of a light year from the sun.

A few comets every year are perturbed from this gigantic reservoir of comets to plunge into the inner planetary system, and they become comets of progressively shorter period, of which comet Halley, comet Hale-Bopp are examples. The sun at the centre of our solar system is just one of a few hundred billion similar stars that make up the Milky Way; and the Milky Way itself is just one of hundreds of billions of similar galaxies that make up the observable universe. Most astronomers believe today that this entire system was created as a result of a gigantic explosion—the Big Bang—that occurred 13.8 billion years ago. But there is no reason to expect that the standard Big Bang model, no matter

how popular, will be the last word on this matter. At every stage in the history of cosmology one particular theory came to be accepted, and every time it turned out to be wrong. There is no compelling reason for thinking that the present popular version of the Big Bang theory will not be replaced or modified at a later date. Other theories, where the universe has no beginning nor end, are in currency at the present time, and one such model may well come to the fore at some later date.

### **Hierarchical World Systems in Buddhism**

In ancient Buddhist texts hierarchical world systems are clearly defined. The smallest world unit is called a minor world system, and a minor world system could clearly be identified with the modern concept of a planetary system. The next unit, comprised of a thousand minor world systems, is said to make up the next stage which is called an intermediate world system. In the ancient text *Visuddimagga* it is stated that “as far as these suns and moons revolve shining and shedding their light in space, so far extends the intermediate world system”. The “intermediate world system” in Buddhism thus lends itself immediately for identification with a galaxy. A thousand intermediate world systems in turn comprise a so called major world system, which can be identified with a cluster of galaxies. In Mahayana Buddhist teachings it is further postulated that there are countless major world systems throughout a Universe without a beginning or end.

Buddhist teachings also expound the idea of the evolution of world systems. Each world system is supposed to go through 4 temporal stages or Kalpas as they are called: formation, continuance, decline and disintegration. Such a sequence is of course clearly discernible in the life cycles of individual stars, planetary systems and even galaxies.

A point about ancient numbers is worth making. The number thousand (or koti) which occurs frequently in these descriptions is open to interpretation as to what it really meant. A hundred billion rather than a thousand would fit better with current astronomical estimates, but one should remember that the translation of the ancient Sanskrit word koti could involve some uncertainties. Some scholars would say that the word koti meant simply a very large number, a number that is way in excess of everyday experience - perhaps even infinity.

### **Microorganisms from Space**

The question of extraterrestrial life can be discussed properly only against the backdrop of the immense vastness of the universe. In my

view we have for too long regarded, without any proof, that life must be special or centred on the Earth. Every textbook of biology starts by confidently asserting, what is in fact a scientific myth for which there was never any proof—the theory of the warm little pond of organics on the Earth in which life is posited to have begun. As soon as biochemists in the 1950s and 1960s had discovered that the complexity of even the simplest bacterium is of an astronomical order, or even supraastronomical order, attention should rightly have shifted away from a small-scale terrestrial origin to a process that embraced far bigger cosmic systems, even the entire universe. Today the primordial soup theory has little or nothing in its favour. Evidence from astronomy, geology and biology itself disputes its validity. In astronomy, the detection of life-relevant molecules has been made in galaxies that are so far away that the Universe was less than one fifth of the present size when their light was emitted.

Forty years ago, together with the late Sir Fred Hoyle, I first began to argue that life is a truly cosmic phenomenon, arising most probably, as a unique, albeit highly improbable cosmic event. The information needed to put life together, even in its simplest and most primitive form, is specific in kind and supraastronomical in quantity. How was this highly specific information acquired in the first place from a situation that was initially thoroughly chaotic? From a very simple calculation, one could infer that the minimal number of trials required to discover the crucial arrangements for life, as for instance in the enzymes, through random shufflings of the components, far exceeds anything that could happen in all the oceans of the Earth, let alone in Darwin's "warm little pond". Once started, however, life must spread inexorably and colonise every habitable niche in the cosmos.

On this theory life is all-pervasive in the cosmos and is carried everywhere in the form of clumps of cosmic dust that contain freeze-dried bacteria and viruses. In our own immediate neighbourhood we argue that life in the form of bacteria must have been brought to the Earth by comets and meteorites. We argued also that a continuous input of such bacterial and viral genes is imperatively needed in order to explain what is known about how life evolved on the Earth from microorganisms to the complex and varied forms we see today.

Recent advances in microbiology, including the discovery that many types of microbes can withstand the harshest imaginable conditions, including exposure to huge doses of ionising radiation, all point to a space origin of life. Microbes have been recovered from the guts of insects fossilised in amber for over 30 million years. In a very recent

study the deepest and darkest frozen Lake Whilliam in Antarctica, sealed away from the outside world for 15 million years, has yielded DNA evidence of life, including complex life, under 4 kilometres of ice. There is no Darwinian sense by which these extreme survival properties could have arisen in isolation on the Earth. Only in an open cosmic system, with the need for surviving space travel, could all these properties have evolved.

This theory of cosmic life is in essence a modern rendering of an ancient idea—panspermia—first discussed by the Greek philosopher Anaxoragas in the 5th century BC. The theory embodies the concept that the seeds of life—microorganisms—are present everywhere and eternally in the Universe. I have already referred to evidence from biology that favours this theory. Astronomical evidence for this point of view has also become so compelling in the past decade, that continuing to deny what now appears to be an obvious fact is fraught with danger. We now believe that we have actually *discovered* the existence of extraterrestrial life in interstellar space and in the dust from comets, in meteoroids collected in the stratosphere in July 2013 and in a Sri Lankan meteorite that fell in 2012.

### **Galaxy as One Gigantic Connected Biosphere**

One of the most exciting areas of modern astronomy is the search for planets that are similar to Earth orbiting distant stars. Many studies directed at such a search are presently under way deploying orbiting telescopes. In the year 2013 the grand total of alien Earth-like planets, in what is still a very small sampling of our galaxy, is already up to 900. And extrapolating from this small sample to the entire galaxy it has been estimated that there are no less than 100 billion such planets—averaging one for every sun-like star. This means that the average separation between two Earth-like planets is a mere 5 light years. This is a very short distance in cosmic terms and clearly shows that exchanges of bacteria and viruses between planets are not just possible, but are inevitable. The entire galaxy, our Milky Way system can thus be regarded as one gigantic connected biosphere. It follows that life of all types known on Earth, ranging from bacteria to plants, animals and even intelligent life, must to a high degree of probability be all-pervasive. All this is of course fully consistent with the teachings of Buddhism.

On the 12th of February 2001 the code for the entire human genome was successfully deciphered. One immediate surprise was that there were a far smaller number of genes coding for proteins than we had

hitherto thought—less than 25,000. But it was in the sequences of nucleotides in DNA that lay outside the genes that the tangled web of human evolution is at last coming to be unravelled. A surprisingly large fraction of our DNA, perhaps as high as 50%, is in the form of viral sequences. And a subset of this is in the form of what we now recognise to be related to “retroviruses”, of a type in which the AIDS virus is an example. Some years ago the late Sir Fred Hoyle and I were ridiculed for suggesting that the AIDS virus may have had a space origin. From what is now emerging it can be seen that this is most likely to be true. Our ancestral line, that led through primates and anthropoids to *Homo sapiens* over hundreds of millions of years, shows clearly the relics of repeated viral or retroviral attacks presumably similar to AIDS. At each such viral attack the evolving line was almost completely culled, leaving only a very small surviving immune breeding group to carry through a form of this virus tucked away in its genome.

Viral sequences added in this way, I believe, provide evolutionary potential that could lead to new genotypes and new species at one end of the scale, and to new traits and the capacity to express our genes in novel ways at the other. I have referred earlier to recent discoveries of cometary microorganisms raining down from space into the stratosphere. The estimate of the total daily input of such material is close to one tenth of a tonne, so it would be foolish to ignore its possible biological implications. The implication for the evolution of life would be profound. Without this continuing input of genes, life on Earth would not have gone past the stage of microorganisms. It is becoming clear that our very existence on this planet is contingent on this rain of bacteria and viruses from space.

### **Pandemic Diseases from Universe**

We have been extraordinarily slow to recognise all the facts that relate to our indubitable cosmic ancestry, but I am convinced that changes of attitude are imminent. In the near future it will become clear that microorganisms—bacteria and viruses—coming to the Earth from outside could also on occasion pose serious threats of pandemic disease not only in humans but also in plants and animals. This is connected with an idea I explored as early as 1979 that most of the pandemics throughout history were driven from space incidence of new viruses and bacteria. With all the data that is currently available across a wide range of disciplines I believe there is an urgent need for the possibility of bacterial and viral ingress from space to be taken seriously. I cannot

illustrate this better than by quoting from an article by Dr. Louis Weinstein in *the New England Journal of Medicine* of 6 May 1976 in which he reviews all the available data relating to the influenza pandemic of 1918/1919 that caused some 30 million deaths worldwide:

“The influenza pandemic of 1918 occurred in three waves. The first appeared in the winter and spring of 1917–1918..... This wave was characterised by high attack rates (50% of the world’s population was affected) but by very low fatality rates.... The lethal second wave, which started at Ford Devens in Ayer, Massachusetts, on September 12, 1918, involved almost the entire world over a very short time..... Its epidemiological behaviour was most unusual. Although person-to-person spread occurred in local areas, the disease appeared on the same day in widely separated parts of the world on the one hand, but, on the other, took days to weeks to spread relatively short distances. It was detected in Boston and Bombay on the same day, but took three weeks before it reached New York City, despite the fact that there was considerable travel between the two cities. It was present for the first time at Joliet in the State of Illinois four weeks after it was detected in Chicago, the distance between those areas being only 38 miles.....”

With no air travel in 1918 a simultaneous first strike in Boston and Bombay is strong evidence of a component of the virus falling in from space. From what I have presented today I maintain that we cannot afford to ignore the evidence. Measures must be put in force to monitor the stratosphere for incoming potential pathogens. In the event of a threat being discovered, preventative measures such as the production of appropriate vaccines could be put in place. In this way it might be possible to avert the worst consequences of any future pandemic caused by space-borne microbes that could threaten us. So much for the ingress of cometary microorganisms from space.

### **Physical Impact on Species & Civilizations**

Another connection between comets and life is the direct physical impact of comets and asteroids on the Earth. The entire history of our Earth has been punctuated by comet impacts from the very first moments of its formation. By far the most fierce and unremitting episode of such impacts occurred between 3.8 and 4 billion years ago, and this period is called the Hadean epoch, or the epoch of Hell. It is remarkable that at the end of this epoch we find the very first evidence of microbial life on our planet, strongly suggesting that this life was in fact brought to Earth by impacting comets. We know now that comet

impacts also brought most of the water that went to form the Earth's oceans, thus making our planet a congenial hope for life.

At later epochs comet impacts died down to a mere trickle, but they did not completely cease. One such impact event that happened 65 million years ago caused the extinction of the dinosaurs and over 85 percent of all terrestrial life. Although major impact events are rare, being separated by tens of millions of years, the interaction of our planet with fragments of comets with sizes ranging from tens to hundreds of metres must have happened frequently, continuing even into historical times. Victor Clube and Bill Napier argued some years ago that a giant comet broke up about 20,000 years ago into such fragments, causing episodes of bunched collisions.

A collision with one such fragment that occurred in 1908 led to the well-known Tunguska event in Russia. An object of about 100 metres across entered the upper atmosphere of the Earth over Siberia in the early hours of June 30, 1908. A great fireball was seen to pass low over the town of Kirensk in Siberia and came down over a remote part of the Siberian taiga. The object did not reach the ground but exploded in the atmosphere at a height of about 8 kilometres. The brilliant fireball, said to have outshone the Sun, was seen as far as 1000 km away from its point of descent; and the sound of the explosion was heard at even greater distances. The immense blast wave felled trees over a distance of some 40 or 50 km, and the heat from the fireball charred tree trunks for distances of up to 15 km from the centre of impact. Estimates of the total energy of the impacting object range from 13–30 megatonnes of TNT, equivalent to the explosive power 650–1500 Hiroshima bombs.

There is recent evidence to suggest that the collapse of the Indus Valley Civilization and the end of the Old Egyptian Kingdom may have coincided with clusters of Tunguska-like cometary bolide impacts. So also do certain events that coincided with the final collapse of the Roman Empire in the 5th century AD. According to Chinese records the period of Nichiren Daishonin in the 12th and 13th centuries, was marked by a broad peak in meteor activity. It is remarkable that this greatly revered monk and scholar who inaugurated a major reform of Japanese Buddhism in the 13th century, who was condemned to death, was spared from the executioner's axe by the dramatic spectacle of a bright, gigantic meteor that almost certainly crashed to the Earth.

Just as in the time of Nichiren Daishonin in the 13th century, there is a growing unease in our 21st century society that is leading people to search for new paradigms to carry them into the future. The unease is not simply confined to science, but extends over a broad front of human



activity, including religion. The latter manifests itself in the large-scale emptying of churches that are causing dismay to church leaders. There is also a wave of intolerance and racism in many Western countries, and the spectre of terrorism and war looms large over the international scene. Most of the world's economies are in deep recession producing rising inflation and unemployment, with unremitting levels of poverty and starvation in store. The twentieth century's goal of economic justice and of fairness and compassion in the world is now only a distant dream. It is here that Buddhism and Buddhist values can play a profoundly important role by seeking to extend the bounds of human sympathy to encompass the whole of humanity, rather than this or that class, or clan or nation. SGI President Daisaku Ikeda's heroic lifelong mission has been to foster the cause of world peace by the propagation of Buddhist values. What better philosophy can there be than one that preaches the unity of all life and universal love? This is the sentiment and the motive that has driven President Ikeda to do more than anyone alive today in the cause of World Peace.

### **Reductionism Cannot Explain Consciousness**

Let me next turn to the subject of consciousness in so far as it relates to cosmic life. What is consciousness and how does consciousness relate to the external world? Contemporary science has not yet been able to tackle such questions, except in a very superficial way. Modern techniques of neurophysiology and experimental psychology have hardly touched upon the nature of the higher levels of consciousness that undoubtedly exist in all of us. Some schools of post Jungian psychology have actually begun to adopt Buddhist attitudes on these subjects as working hypotheses from which tests and experiments could be devised.

The reductionist methodology of science has undoubtedly succeeded in unravelling the chemical nature of life including the workings of the individual cell, but there is scarcely any understanding of the true nature of consciousness and of the workings of the brain at its highest levels of performance. The starting premise from which most scientists have probed the workings of the human brain excludes the existence of "mind" as a distinct entity. Recent research, starting from such a negative premise, is now leading to a contradiction whereby qualities of consciousness or mind are seen to emerge as entities distinct from the physical structure of the brain. Using the language of computers, the physical and chemical structure of the brain constitutes the hardware; consciousness and mind constitute the software for expressing personal-

ity, emotions, creativity and a good deal more. Reductionist science has thus far failed to come to grips with the nature of the software that drives the biological computer which is the brain.

Buddhism recognises the existence of a sequence of conscious states, starting the lowest levels of consciousness associated with basic sensory perceptions such as touch, smell and sight, to a transcendent consciousness that is essentially universal in character. In Mahayana Buddhist traditions the highest ninth state of cosmic consciousness is called the *Amala* Consciousness. *Amala* consciousness, which is supposedly present in all of us, can be seen, when it is awakened, as merging with some all-pervasive quality of the Universe.

The Buddhist concept of human life is that each of us is a psycho-physical unit comprised in its most primitive state of three components; the sperm and the ovum that go to make the zygote along with a packet of consciousness derived from the cosmos. The union of all three components is required in order to form a conscious human being.

Before leaving the subject of consciousness it is worth pointing out that ideas connected with consciousness have also entered the stage of the physical sciences, particularly with the emergence of quantum mechanics. Until the advent of quantum mechanics it was thought that the operation of making a measurement on the Universe is divided into two distinct components: the subject that perceives and the object that is being perceived. This division has now become blurred. On the scale of atoms the perceived universe is intimately connected with the consciousness of the observer through the act of observing itself. This has given rise to the phenomenon known as the “collapse of the wave function” which many eminent scientists including, Eugene Wigner, explicitly identified as a quantum version of the mind-body problem. It is indeed quite remarkable that all these concepts are fully in accord with the Buddhist idea that consciousness is the ultimate source of all knowledge.

### **“Universal Consciousness is the Font of All Knowledge”**

Because the modern scientific viewpoint is derived from the application of the methods of empirical science one might wonder how the same conclusions could have been reached 2500 years ago, long before the advent of modern techniques—for example microscopes and telescopes. The answer could lie in the powers of introspective meditation in which higher conscious states are involved, powers to which Indian sages have testified for thousands of years. If we are indeed creatures of the

Cosmos, as the evidence tends to show, would it not be reasonable that we have some innate knowledge of the nature of the cosmos itself hidden deep within ourselves? A relationship between the microcosm of life and the Universe at large must exist for the simple reason that the one is derived from the other. When a modern well-educated scientist makes an inspired connection between apparently disparate natural phenomena, we are happy to say that intuition was involved. This intuitive process could not be fundamentally different from the manner by which the Buddhas discover truth. The Universal aspiration to Buddhahood or knowledge, embodied in Mahayana Buddhism, implies that a form of cosmic consciousness is latent within each of us.

The idea that such a Universal consciousness is the font of all knowledge, with its implication of the interconnectedness of the many different attributes of the Universe, combined with an abiding respect for all life on our planet, can be regarded as the central tenet of a holistic Buddhist philosophy. The very survival of our social institutions and of humanity itself could well be contingent upon the adoption of such a world view.

We have seen in this article that life is a phenomenon that cannot be confined to the Earth. Likewise consciousness and intelligence also cannot logically be regarded as exclusively terrestrial. On other planets orbiting other stars similar forms of intelligence must have arisen as a natural consequence of the evolution of cosmic life. It is also highly likely in the author's view that science and technologies of the kind we find on Earth have also arisen in countless other places, and consequently also convergent patterns of social and religious development. We may thus expect to find that only those extraterrestrial civilizations that acquired Buddhist-type non belligerent philosophies would have the longest persistence in the Universe. Those that did not will self-destruct on relatively short timescales, as indeed our own conflict-riddled human societies are threatened at the moment. There would thus be a process of cosmic natural selection favouring Buddhist-type social organisations which would be endowed with the highest levels of longevity.

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