THE NASH LECTURE

APPROACHING "WOULD YOU BAPTIZE AN ALIEN?"
FROM THE PERSPECTIVE OF A JESUIT AND ASTRONOMER

by

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Read 2 November 1995

I: The Question

"Would you baptize an alien?" I really was asked this provocative question. It came from Jack Hitt, a writer for the New York Times Magazine, when he was interviewing for an article on the Vatican Observatory. When the article appeared about a year and a half ago,[i] Jack portrayed me as being more awkward in responding than I remember. What I do remember is thinking, "What a silly question! Can't he ask anything more important?" Be honest and confess that you had a similar reaction to this lecture's title. The perceived triviality in the question can come from two positions: for some, an extraterrestrial is an impossibility, and so the question should never arise; for others, aliens must be around somewhere in the vast universe, and so they should clearly be proselytized and baptized when found. The two positions are rather exaggerated here, but I do think these two poles are worth examining, since this will illuminate quite strongly the relationship between science and theology. At the outset, I shall have to be frank and say that the initial question may receive a less than perfectly satisfying answer, at least for Jack Hitt.

II: The Question in History

In order to lay foundations for answering the title's question, I need to move, for a while, from the matter of baptizing aliens to their existence. For, behind our reactions to the question of extraterrestrials' existence lies our philosophy, and similarly our theology and scientific method. This has come clear to me through discovering the long history of thought about whether there are indeed aliens. We are far from being the first – or the last – to wonder about extraterrestrials. The two camps were set up by ancient Greek philosophers, particularly Epicurus and Aristotle in the fourth century B.C. (For clarity in what follows, the ancients' use of the term "many worlds" is better rendered for us as "many universes." Only as the Sun became understood as a star among other stars could the question of many other earth-like worlds arise, and consequently, if many such worlds, then other intelligent life.)

> There are infinite worlds both like and unlike this world of ours. For the atoms being infinite in number, as was already proved, are borne on far out into space.

> For those atoms which are of such nature that a world could be created by them or made by them, have not been used up either on one world or a limited number of worlds .... So that there nowhere exists an obstacle to the infinite number of worlds. (Epicurus)[ii]

> Either, therefore, the initial assumptions must be rejected, or there must be one center and one circumference; and given this latter fact, it follows from the same evidence and by the same compulsion, that the world must be unique. There cannot be several worlds. (Aristotle)[iii]

What we have here are two perspectives of the universe: the philosophy of atomism (all matter is made up of microscopic atoms) leads to a plurality of worlds; the philosophy of absolute natural place (each element moves towards its natural place) leads to a uniqueness of the world. These perspectives are not a matter of personal sincerities, as we would find in a New Age approach to truth,[iv] but of a philosophical understanding of the nature of matter.

So, the debate about extraterrestrial life was joined. It has been a very popular topic of discussion, with a large literature,[v] reflecting no doubt the conversations in numerous coffee-houses and pubs. Even Albertus Magnus, the teacher of Thomas Aquinas, said that the concept of a plurality of worlds was "one of the most wondrous and noble questions in nature."[vi] Albert was keenly interested in the natural world, such that he became the patron of students of the natural sciences, and this probably explains his enthusiasm for the topic. However, I shall have to be very selective and draw upon just a few players: John Herschel, William Whewell, Angelo Secchi, and Dominic Caronna.

John Herschel (1792-1871) was the sole son of the famous British astronomer, William Herschel, whose pluralist views (and genius) were passed on to his heir. The younger Herschel had the finest of scientific educations available and brought this to bear on his observations, some made from as far away as the Cape of Good Hope, and on his writings. So, it was curious that in his two major books he endorsed his father's claims that the sun and the moon had inhabitants, even though his science made inhabitation of the broiling sun and the airless moon increasingly problematic. For all of John Herschel's scientific achievements it was clear, but not to him, that his "belief in extraterrestrial life rested largely on metaphysical and religious assumptions concerning the plans and purposes of the Creator ..." (Michael Crowe).[vii] Herschel's underlying assumption was that, if the universe existed for the purpose of life, that purpose could not be adequately filled by one, tiny earth. So, it was his scientific perspective that led him to go beyond that perspective, without realizing he was doing so.

A truly fascinating person in the debate is William Whewell, a contemporary of John Herschel and likewise a prominent Cambridge scholar. Whewell, for many years a proponent of the plurality of worlds, changed his mind and attacked it in 1853. The fascination is with "why." What seems to have happened, according to Michael Crowe,[viii] is that Whewell came to appreciate the full significance of the Copernican revolution that took humans from their place in the centre of the universe and threw them out among the billions of stars. For Whewell, that

change of perspective was an oppressive, desolate, and dark thought indeed. Further, it was a thought that raised the theological problem of reconciling these many worlds with the fact that God had intervened in human history in a special way, through the incarnation and redemption of Christ. Whewell was living in the days before our science had shown how finely tuned must the universe be to allow life and how even its vastness is needed for any life to appear. Such fine-tuning is the basis of the Anthropic Principle which, in a theological context, can restore us to the centre of God's scheme.[ix] (In deference to possible aliens and to avoid chauvinism, perhaps we should now call this the Sentientric Principle.)

An astronomer who was not at all perturbed by the Copernican change in perspective was Angelo Secchi (1818-78), a Jesuit and a director of the Roman College Observatory. In 1856 he wrote: "it is with a sweet sentiment that man thinks of these worlds without number, where each star is a sun which, as minister of the divine bounty, distributes life and goodness to the other innumerable beings, blessed by the hand of the Omnipotent."[x] Secchi conceded that these worlds may not be accessible to his telescopes, but by analogy with the earth and the solar system he was well persuaded that the universe is a wonderful organism, filled with life. So, even if Secchi's science failed him in proof, it fueled his sense of the limitless wonders of the universe. This open enthusiasm for plurality was remarkable in one so close to a usually cautious Vatican, but it will strike a chord in many of us who have enjoyed the myriads of stars on a dark night.

In case anyone thinks that this is where history leaves us, with the debate settled in favour of the extraterrestrial, I would mention one friend with whom I have enjoyed many a luncheon. This is Dominic Caronna, who has completed the manuscript form of his book, "Death of the Bible?" The question mark at the end of the book's title is important, for Caronna by no means believes that the bible is dead. Instead, he believes that extraterrestrials are "dead," since he focuses on "the unicity of God" (his term for describing unity, completeness, and absoluteness in God) to show that it would be absurd for the events of the bible, particularly the incarnation and redemption, to be repeated elsewhere in the universe. Since Christ is unique, so must human beings be the only intelligent life in the entire universe. Caronna, given his premise, makes arguments that are clear and sound, as you would expect from a lawyer with a philosophical education. My role in the lunchtime meetings was to try and place a "reasonable doubt" within him that his scientific perspectives of the limitless universe (Caronna is one of the few people I know who have read through Stephen Hawking's A Brief History of Time) might actually be saying something about the Creator that would have to modify his understanding of unicity. We are still friends, despite the sleepless nights he claims that I gave him, and we meet regularly, so the contemporary debate continues – as it perhaps does for you too.

III: The Need for Clarity

The point of these examples from history is to bring out what is influencing one's position in the many worlds debate. Remember how the person we would have expected to be very rational and scientific about the question, John Herschel, turned out to be influenced largely by the principle that life was of itself abundant and so had to fill the universe whose huge extent

was revealed to him by his science. Herschel is not alone: today you will find people saying the same thing; and most thinkers from history can be shown to have underlying principles. Now, there is nothing wrong with having such principles (or assumptions): what is unfortunate is not recognizing them as such.

These principles can be categorized under three headings: philosophical, theological, and scientific. The philosophical principle that influenced Aristotle in the debate was that everything is composed of the four elements, each seeking its natural place, and so, for instance, while earth naturally moves downwards, fire moves upwards. Aristotle was quite aware that he absolutized this principle: there was only one place towards which, say, earth could move, and so there was only one Earth, only one possible world. All this is rather foreign to our scientific way of looking at movement nowadays. However, Aristotle derived his theory of movement from his theory of causes, and this fits in quite well with contemporary theology and some contemporary philosophy.

The idea of Epicurus and the Atomists, that the matter (atoms) in the universe is boundless and so must inevitably provide the means for other life, is quite familiar to us since it is very similar to that of Herschel and of scientists through the ages. This principle of abundance of atoms, or plenitude in the universe gets translated into a theological principle for Secchi, who sees the abundance as there to provide the arena for a bountiful Creator to exercise the divine nature, for God to be who God is. So, the philosophical principle of plenitude has its complementary theological principle, that of purpose or teleology. Johannes Kepler, whose laws of planetary motion laid the foundation for Newton's gravitational laws, conjectured that the four moons of Jupiter must be meant for Jovians, not for us, who after all cannot see them without a telescope (it took Galileo to tell us about them first). He invoked the theological principle that God does nothing useless to conclude that Jupiter must be inhabited. In doing so, Kepler turned around the same argument that his master, Tycho Brahe, had used when confronted with the possibility of vast, useless spaces between and actually on stars. For Brahe had earlier argued against the Copernican theory that the sun was the center of the universe on the grounds that this would imply a lack of purpose, a lack of harmony among things.[xi] So, principles can be turned to argue both ways in the many worlds debate.

For Thomas Aquinas, a main theological principle was that of perfection, which included the ideas of unity and of order (a hierarchy of relations) whenever God acts in creation. I think that there is little question among theists about God having these attributes; the question comes in the definitions and implications of doctrines. George Schner (Regis College, Toronto) and others refer to theological doctrines and propositions as "rules for theological discourse," since they set the parameters and context for theological explanations. For some Christians, the rules of the fall of humanity and its redemption through an incarnate God, when coupled with the perfection of God, imply that this programme could only have happened once and so that humanity is unique in the universe. If Christ is not the absolute communication of God, then God has deceived us – which is a contradiction. This is the argument that Caronna has followed, in the tradition of Aquinas, Whewell, and the rest. For others, the perfection of God, which was exhibited in the redemption of humanity, must be balanced against God's

omnipotence. So we find in 1277 A.D., relatively early on in the theological debate, the very blunt condemnation by the bishop of Paris, Etienne Tempier, against beliefs (among 218 others) "that the First Cause cannot make many worlds."[xii] Clearly, the argument is not going to be solved by the swopping of "anathema sit" (an ecclesial curse and excommunication) among those who would condemn the other side, but by resolving just what these principles mean and so what might be their harmonization.

In case the scientists among us feel a bit smug over the quarrels of the philosophers and theologians, I should point out that there is a need, when looking at the many worlds question scientifically, to guard against mixing other than scientific principles into the argument. Herschel's stretching of the scientific evidence about the sun and the moon to accommodate his solarians and lunarians on these bodies is but one example of mixing a philosophical principle into a scientific discussion. It was Roger Joseph Boscovich (1711-87), a Jesuit scientist, philosopher, and poet, who brought scientific clarity back into the discussion of lunarians by analyzing occultations of objects by the moon and concluding that the moon possessed too thin an atmosphere, if any, for supporting life. With that clarity established, Boscovich could allow himself to speculate on possibilities, based on what he knew of the physical world. He imagined beings insensitive to fire and multiple universes, and so he entertained the idea of many worlds, or at least of many universes. We have seen that Secchi's theology coloured his scientific appreciation of the boundless nature of the universe. Again, there is nothing wrong in this, but the limits of discourse must be clear to the individual. Some claim that Teilhard de Chardin, the Jesuit and paleontologist, mixed his science with his theology and philosophy to come up with the idea of the progress of evolution towards a spiritualized "Omega Point." However, such mixing was not the conclusion of a Jesuit theologian, Cuthbert Donnelly, who came to know the operation of Chardin's mind quite well when they worked together in Rome to try and bring Chardin's writings into a form that would be acceptable to the Vatican. I enjoyed an hour or so of interviewing an elderly Donnelly in Wimbledon, London. That was in 1977, but I still well remember how Donnelly emphatically witnessed that Chardin knew he used his paleontology to inform his philosophy and theology, but kept the three disciplines clearly separated.

How might we attain that clarity? A first "clarifier" is to recognize and preserve the limits of each discipline. For instance, science cannot address the reason why something exists rather than does not exist. Its methodology brings out processes among material things, not purpose and meaning. So, the words "creation of the universe" when applied in scientific cosmology and when used in theology have to mean two different things: we should be clear whether we are talking about physical interactions or about the work of a non-physical, Prime Mover.

A second and related clarifier is to find the right relationship between the disciplines. When I wrote on science and faith a couple of years ago, I said that faith

> cannot be used to support or dictate the correctness of a scientific theory: e.g., the Big Bang model of the universe or natural selection in biological evolution do not

> find authentication through the first chapter of Genesis. Neither can a scientific theory support a theological concept: e.g., the Big Bang does not ground, of itself, an absolute beginning in time of creation. The two need a weaker logical relation, such as Ernan McMullin's suggestion of "consonant with":[xiii] thus, God's ordering in the Genesis account is consonant with the order science finds in the cosmos. People are still debating the right "c" word to use (congruence, consonance, concord ...), but it must be one that preserves the rightful autonomy of each kind of knowledge while allowing for some proper interaction.[xiv]

Much has been written on the correct relationship between science and theology,[xv] but the above will suffice regarding the many worlds question. Now that we are alert to some of the influences and principles that affect us, we can look with increased clarity at the evidence for extraterrestrial life.

IV: <u>The Evidence</u>

The scientific evidence for life beyond the Earth is tantalizing. Unlike Herschel, who had to invent ways that solarians could live on the burning Sun or survive on an apparently airless moon, we can probe much further out, even beyond our Solar System to find out whether there may be other habitable planets. We do already know some intriguing things: when stars form, most do so with surplus gas and dust particles surrounding them which can be detected in the infrared and which can be the source-material for planets; three massive, Jupiter-like planets are the best way to explain the variations in the period of their host-star, now a pulsar, PSR B1257+12; Michel Mayor and Didier Queloz recently claimed that a near Jupiter-mass planet is orbiting the solar-like star, 51 Pegasi, only 42 light years away from us.[xvi] The prospects of finding more evidence for planets around nearby stars, and even for a planetary environment modified by life, are very good as telescopes and their instrumentation improves. So, in grant proposals for such technical improvements the appeal to the popular, planet-search theme is justified. We live in exciting times, astronomically-speaking.

It is as potentially exciting on the biological side of the scientific question. However, while the existence of habitable planets around other stars, the first condition for other life, is widely believed (but not yet indisputable), the exact process of how life appears, the second condition, is not established. We do know a vast amount more than we did a few decades ago about the building blocks of life, and that the first blocks were more likely to be RNA (ribonucleic acid) than DNA (deoxyribonucleic acid). The quest is now to find out how the RNA strings of genetic coding arose in the first place. Producing amino acids from laboratory-simulated, primitive atmospheres, which was pioneered in 1953 by Stanley Miller and Harold Urey, is just the beginning of the story. The crucial step is the one from chemistry to life, but at least we can say that the "chemistry for life" is abundant in the Solar System and in the Galaxy. Still, the answer to whether there are other life-bearing planets is still just beyond our scientific reach.

With the hope of extending that reach, the various Search for Extraterrestrial Intelligence projects (SETIs) were started. In the tradition of Frank Drake's first search in 1960, these use large radio telescopes, sophisticated receivers, and modern data analysis to look for signals coming from an intelligent origin beyond our Solar System. A promising boost to SETI was the funding through NASA of the first large-scale, systematic search in 1992. When the U.S. Congress cancelled that project a year later, it re-arose as the privately-funded Project Phoenix, whose first technically successful run took place earlier this year. I heard a report of that first run from the project director, Jill Tartar, and I was impressed by the team's technical sophistication and enthusiasm. For all that expertise and effort, and even though radio searches hold the best promise for finding other intelligent life, there has been no detection yet, only good reasons to continue; so they keep looking and hoping.

The situation seems no better on the theological side. We can swop "proof texts" from scripture, such as John 1:10 ("He was in the world [i.e., singular] that had its being through him ...") or Ephesians 1:10 ("... he would bring everything together under Christ, as head, everything in the heavens and everything on earth"); but the historical debate over the many worlds question has not provided any theologically compelling evidence that traditional religions should uphold or deny many worlds and their extraterrestrials. If there had been any such evidence, the debate would have ceased (as would have the scientific debate, given any concrete scientific evidence). What we do have[xvii] is the indifference shown to the question by Hinduism and Buddhism, the inevitability of other intelligent life for the Mormons, the possibility of the prophet being replicated elsewhere for Moslems, and the lack of official pronunciation by the Christian religions (except perhaps that of the Bishop of Paris, Tempier, if his condemnation is taken as an affirmation).

The same lack of conclusion is shown by philosophy. We have become aware that there are principles underlying people's positions. Any of these a priori principles have to be tested, in the end, by their coherence with the experienced, though not purely physical, universe. For example, Steven Dick points out how the concept of extraterrestrial life became a serious concern just as scientific theory drew a better picture of the universe.[xviii] With respect to aliens, philosophy can only look at the possibilities, not at actualities, until the evidence is forthcoming. Where philosophy can help is in our understanding of self-conscious, rational life. This matter-to-mind step may be an even bigger one than from chemicals to life, and one comparable with the discontinuity of the Big Bang that seems to have begun our present universe; but standing on that step opens up an expanse of study too large to explore in this lecture.

V: The Original Question

At this point I am tempted to say with Mark Twain, "First gather the facts, then you can distort them at your leisure." The facts are that aliens are an astronomical probability (in view of the probability of other planets), a bio-chemical possibility (since the exact origin of life is still not understood), and a theological and philosophical wait-and-see. The distortions come from our own prejudices that dictate whether we believe or not in aliens (note the word "believe"). Although I have shown that we cannot say whether there is other intelligent life in the universe, is it even worth answering the original question, "Would you baptize an alien?"

Certainly, since I find the key both to the worth of answering and to an actual answer in the idea of exploration. That idea is vital to progress in the physical sciences, for without curiosity in how things work there would have been no understanding of planets and stars and galaxies, and further, no significant progress in technology. Exploration is also needed in the "sciences" of theology and philosophy, so that the same urge to push back the boundaries of knowledge can bring new insights into traditional doctrines and questions. So, even though we may be alone in the universe, answering the question about "baptizing aliens" will extend our understanding, at least of ourselves and the known universe; we can explore our principles and the known data, as we are doing right now.

So, given an encounter with aliens, what would I do? I would try and "explore," both scientifically and theologically, the phenomenon.

This exploration is what I do daily in my scientific research with the spectrum, or rainbow, from a star. That spectrum has more than colours (and indeed, I look at it as just a black-and-white tracing of intensity): there are features of relative darkness where part of a colour is missing, and these features characterize the star's physical conditions. When I look at a particular star's spectrum, I look at it as a specimen: I try and let that star be what it is, without forcing it into a classification category. It may end up being classified easily, and 95 per cent of stars fall readily into the Morgan-Keenan classification system, but I would loose potential insights if I jumped too readily to a classification for that spectrum. I find my preferred way of doing science is synthetic, starting with observations, rather than analytic, starting with theory. So, scientifically, I would try to explore the alien by letting "it" be what it is, without rushing for a classification category, not even presuming two genders.

Similarly, I would let the alien be what it is theologically, without rushing for the baptismal water. Perhaps it is better to speak of letting the alien "reveal" what it is, since Christians speak of the essence of the Christ-event as the concentrated point of God's "self-revelation" to human kind.[xix] We find the Gospel of St. John appropriately using "Word," Logos in the Greek, to describe this divine self-communication. But while Christ is the First and the Last Word (the Alpha and the Omega) spoken to humanity, he is not necessarily the only word spoken to the universe.

I mean that in two senses. Firstly, the Word spoken to us does not seem to exclude a "Word" spoken to aliens. They, too, might have had their "Logos-event." Whatever that event

might have been, it does not have to be a repeated death-and-resurrection, if we allow God more imagination than some religious thinkers seem to have. God, as omnipotent, is not restricted to human language. That lack of restriction is a clear message after Christ's resurrection, when the human boundaries of room walls are no obstacle to the Risen Christ's appearances. Secondly, while the concentrated point of God's revelation is in the death-and-resurrection of Christ, that revelation is deepened daily for each Christian through the experiences of his or her life. Revelation, in that daily sense, is mediated to me also through my science and discoveries. We just have to think of the Copernican universe, the evolution of biological species, or the discovery of the Americas, to see the difference these have made for the context in which the Word of God is spoken to each generation. We understand revelation slightly differently, though not more fully, by living in a different world than the first century A.D. of the New Testament.

If we wonder about the actual act of baptizing any alien, we run into questions about the nature of a Sacrament, which has a divine origin and a human component. Here we seem to be waiting for a the next Vatican Council to decide whether the sacrament of Baptism is applicable to "non-human" believers. I like to think that it will be just a question of insisting that the aliens provide their own "water" for the liturgy, whatever that might be for a silicon-based life-form.

So, my final answer to Jack Hitt's question is "no," at least not without first letting the alien be, as a specimen and as a revelation.

VI: Ending Vision

This is a different answer to that of traditional missionaries, whose compulsion to baptize dominate some hagiographies. So, I have a sense of having walked where angels (but not aliens!) fear to tread. Indeed, Arthur Peacocke, a biologist and theologian, in his Theology in a Scientific Age gives never a mention to the possibility of aliens. Yet, I am glad to have had this opportunity to consider more fully the question that Jack Hitt posed me. That consideration has allowed me to reflect on how I approach the unknown, both in doing science and in living faith. I find that this approach should be guided, even driven, by an openness to the phenomenon. That openness tries to be aware of its assumptions. It becomes informed by past experience and a structured knowledge. So, it is not a New Age "openness," but it brings a really deeper understanding to what has already been revealed and to what is to come. It is from that "grounded openness" that I can appreciate the vision Alice Meynell expressed in the last four verses of her Christ in the Universe.

No planet knows that this
Our wayside planet, carrying land and wave,
Love and life multiplied, and pain and bliss,
Bears, as chief treasure, one forsaken grave.

Nor, in our little day,
May His devices with the heavens be guessed,
His pilgrimage to tread the Milky Way,
Or His bestowals there be manifest.

But, in the eternities,
Doubtless we shall compare together, hear
A million alien Gospels, in what guise
He trod the Pleiades, the Lyre, the Bear.
O, be prepared, my soul!
To read the inconceivable, to scan
The million forms of God those stars unroll
When, in our turn, we show to them a Man.[xx]

i. Jack Hitt, "Would You Baptize an Extraterrestrial," New York Times Magazine, May 29, 1994, p.36.

ii. Cyril Bailey, ed. and trans., Epicurus: the Extant Remains (Oxford, 1926), p.25.

iii. W.K.C. Guthrie, trans., On the Heavens (Loeb Classical Library, Cambridge, Mass., 1953), bk 1, ch 8, 277a, lines 11-13.

iv. George Englebretsen, "Postmodernism and New Age Unreason," Skeptical Inquirer, 19, No.3 (1995), p.52.

v. See Steven J. Dick, Plurality of Worlds (Cambridge U. P., 1982) and Michael J. Crowe, The Extraterrestrial Life Debate 1750-1900 (Cambridge U. P., 1986).

vi. Alberti Magnus opera omnia (Aschendorff, 1971), vol. V, pt. 1, p.55, translated in Dick, Op.Cit.

vii. Crowe, Op.Cit., p. 217.

viii. See Crowe, Op.Cit., p. 265 ff.

ix. A simple discussion will be found in John Polkinghorne, Serious Talk (Trinity Press, 1995), p.68-72, while a fuller discussion and references are given by G.F.R. Ellis, "The Theology of the Anthropic Principle," in Quantum Cosmology and the Laws of Nature, eds. R.J. Russell, N. Murphy, and C.J. Isham (Vatican Observatory and CTNS, 1993), p.367.

x. A. Secchi, Descrizione del nuovo osservatorio del collegio romano (Rome, 1856), p. 158, translated in Crowe, Op.Cit.

xi. See Dick, Op.Cit., p.74.

xii. The 219 condemned articles are listed in translation by L. Fortrin and Peter D. O'Neill, Medieval Political Philosophy: A Source Book, eds. Ralph Lerner and Muhsin Mahdi (Glencoe, N.Y., 1963), pp. 337-54.

xiii. E. McMullin, "How Should Cosmology Relate to Theology", in The Sciences and Theology in the Twentieth Century, ed. A.R. Peacocke (Univ. Notre Dame Press, 1981), p. 30 ff.

xiv. C.J. Corbally, "Science and Faith: An Astronomer's Perspective," America, 170, No.12 (1994), p.22.

xv. The options are reviewed by Ian G. Barbour in his Religion in an Age of Science (Harper Collins, 1990).

xvi. M. Mayor and D. Queloz, Letter to Nature, October 1995.

xvii. See review by Michael Ashkenazi, "Not the Sons of Adam: Religious Responses to ETI", a paper to the 20th Review Meeting on SETI, 42nd Congress of the International Astronautical Federation (Montreal, Canada), 1991.

xviii. Dick, Op.Cit., pp.188-9.

xix. See, for instance, Arthur Peacocke in his Theology in a Scientific Age (Fortress Press, 1993).

xx. Quoted by Crowe, Op.Cit., from The Poems of Alice Meynell (New York, 1923), p.92.