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On the plurality of inhabited worlds: a brief history of extraterrestrialism

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Abstract: This paper delineates the cultural evolution of the ancient idea of a plurality of inhabited worlds, and traces its development through to contemporary extraterrestrialism, with its foundation in the physical determinism of cosmology, and its attendant myths of alien contact drawn from examples of British film and fiction. We shall see that, in the evolving debate of the existence of extraterrestrial life and intelligence, science and science fiction have benefited from an increasingly symbiotic relationship. Modern extraterrestrialism has influenced both the scientific searches for extraterrestrial intelligence (SETI), and become one of the most pervasive cultural myths of the 20th century. Not only has pluralism found a voice in fiction through the alien, but fiction has also inspired science to broach questions in the real world.

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Introduction

Since Darwin's original publication of *The Origin of Species* in 1859, analogies have been drawn between scientific and cultural evolution. Herbert Spencer (1996), a contemporary of Darwin's, characterized the evolution of civilization, which he envisaged as progressing towards a form of English Victorian utopia. Karl Marx (1867) used an evolutionary analogy in the development of his theory of class struggle as the engine of historical materialism, and the historian Arnold Toynbee (1946) used evolutionary ideas in his claim that over 30 discrete civilizations could be identified in cultural history. Finally, the American physiologist, linguist and evolutionary biologist Jared Diamond (1997) used evolutionary analogies as part of his non-racist, non-Eurocentric history of humanity over the past 13 000 years.

The possible origins of cosmic pluralism

In tracing the possible origin and development of the concept of cosmic pluralism, it is instructive to trace the revolution in cosmology that transformed Aristotle's static, walled-in, geocentric two-tier system into the contemporary infinite universe of standard big bang cosmology. The shattering of the dominant ancient Greek cosmology of nested crystalline spheres not only shifted the focus from geo-centrism to an open universe, but also introduced the possibility of the uniformity of natural law. Once the idea of cosmic pluralism had been re-established, evidence supporting the harmony of terrestrial and celestial physics began to mount. Furthermore, it was realized that the case for the uniformity of physical law may also hold for biology. However, whereas evidence began to mount for the former through theory and observation, the latter still remains unproven. Biology remains parochial, and in this sense cosmic pluralism is still merely a revolution of the mind, a theory still to be corroborated by empirical evidence, but the search for such evidence has been adopted in the 20th century in earnest through programs such as searches for extraterrestrial intelligence (SETI) and the continuing robotic exploration of our own solar system.

How and when did the idea of a universe seeded with life develop from the merely physical to embrace a more biological dynamic? And how has extraterrestrialism gained such currency in the 20th century consciousness? In attempting to track such developments, it becomes clear that the cultural evolution of pluralism is bound up initially with the struggle of cosmological and theological worldviews. This may later help to explain the emotional attachment that many invest in extraterrestrialism, perhaps far more than most scientific beliefs.

The concept of cosmic pluralism arose as an integral part of ancient creation myths, or as a constituent element of cosmic mythological worldviews (Dick 1998). In the ancient Vedda culture of Ceylon, the belief in the migration of the soul after death was linked with the concept of a plurality of habitable worlds (Sagan & Shklovskii 1966). However, the distinct idea that life might be seeded throughout the cosmos beyond this planet (the plurality of inhabited worlds belief) probably germinated in human consciousness during the burgeoning Greek cosmology in the 5th century BC. With these formative attempts to provide a rational basis for the understanding of nature, we can trace differences in emergent pluralism from its creationist counterparts.

Essentially, the early Greek idea of cosmic pluralism was secular in nature. It is, in many senses, a levelling belief that there are people like us inhabiting planets like ours out in the vastness of deep space. It differs markedly from the concept of a Creator; the idea that there is a cosmic benevolent dictatorship of a single, overarching, omnipotent intelligence responsible for creating and controlling the cosmos. Indeed, such emotive approaches to the question of extraterrestrialism are with us still, and so is the religious unease on the question of pluralism.

Most of the early Greek philosophers believed that the Earth was not the sole dwelling place of intelligent life. When one considers the understandable limitations of science at the time, these rational foundations of extraterrestrialism suggest great originality and ingenuity. We have seen that the idea of sentient beings beyond the Earth was related to early attempts to understand nature; it was already present in the earliest rational cosmological worldviews of Democritus and Epicurus.

The Epicurean School taught that many habitable worlds, similar to Earth, existed in the cosmos. For instance, the Epicurean, Metrodoros, maintained '*to consider the Earth the only populated world in infinite space is as absurd as to assert that in an entire field sown with millet only one grain will grow*' (Sagan & Shklovskii 1966, p 3).

To a large extent the early development of the extra-terrestrial hypothesis was based on the physical principles of coexisting cosmological systems (Dick 1996). So it was with ancient atomism, a doctrine eventually disseminated throughout Europe by the Roman poet Lucretius (*circa* 99–55 BC) whose *On the Nature of Things* supported the idea of pluralism. Curiously enough, Lucretius was an ardent exponent of pluralism even though, of course, he did not understand the true nature of the stars (Sagan & Shklovskii 1966). The physical principles of atomist cosmology led directly to the concept of infinite worlds, although the importance of the Pythagoreans, especially Aristarchus, to the progress of both Aristotelian geocentrism and Copernican heliocentrism (Guthrie 1950; Koestler 1959) should also be emphasized. However, it was almost 2000 years before the extraterrestrial hypothesis would be revived from its dormancy with the birth of modern science.

Aristotle's two-tier universe

For two millennia Aristotle's cosmology held sway. The Aristotelian cosmos was a two-tier, geocentric universe (Guthrie 1950; Koestler 1959; Hoskins 1997; Dick 1998). The Earth, mutable and corruptible, was placed at the centre of a nested sphere of crystalline celestial spheres, from the sub-lunary to the sphere of the fixed stars. The sub-lunary sphere, essentially from the Earth to the Moon, was alone in being subject to the horrors of change, death and decay. Beyond the Moon, the supra-lunary or celestial sphere, all was immutable and perfect. Crucially, the Earth was not just a physical centre but also the centre of motion, and everything in the cosmos moved with respect to this single centre. Reasonably, Aristotle declared that if there were more than one world, more than just a single centre, the elements of earth and fire would have more than one natural place toward which to move – in his view a rational and natural contradiction.

In this way the idea of the plurality of worlds suffered from its denial of the basic tenets of Aristotle's cosmology. The Aristotelian doctrine of matter, his doctrine of four elements, essentially Aristotle's physics, ran counter to extraterrestrialism. Aristotle concluded that the Earth was unique. In an analysis of why one idea may be selected by its environment over another, we can offer a number of reasons why Aristotelian geocentrism became the dominant paradigm (Koestler 1959). The massive bulk of writings of Aristotle's (and Plato's) that survived, the institutions of the Academy and the Lyceum that continued to propagate the ideas and the evolved synthesized systems of philosophy which seemed to provide a complete answer to the predicament of political, economic and moral bankruptcy of classical Greece. And as Richard Dawkins (1989, p 325) points out: '*Nevertheless, there is a sociology as well as a logic to science. Some bad scientific ideas can spread widely, at least for a while. And some good ideas lie dormant for years before finally catching on and colonising scientific imaginations.*' So it was with Aristarchus and heliocentrism.

The Latin West, where Aristotle's physics was embraced and elaborated upon, took up his system in Christian teachings on the nature of creation. For Christians, pluralism directly disputed the notion of omnipotent God. If God had wished to create another Earth, how could He do so without violating Aristotle's physics? Thomas Aquinas was among those who argued that God's perfection and omnipotence were reflected in the unity of the world. Others (e.g. Kuhn 1957, p 111) have emphasized the importance of Aristotle's model of the cosmos to Dante's great epic, the *Divine Comedy*. Essentially a description of the poet's journey through the 14th century Christian universe, the quest starts on the surface of the Earth, descends into the bowels of the Earth through the nine circles of Hell (which mirror Aristotle's nine celestial spheres above) and '*arrive at the vilest and most corrupt of all regions, the centre of the universe.*' The poet then journeys through each of the celestial spheres above, finally contemplating God's Throne in the last. Dante made it appear that the medieval universe could have had no other structure than the Aristotelian–Ptolemaic, underlining the central importance of the position of the Earth to the drama of Christian life and death; essentially '*vastest of all themes, the theme of human sin and salvation, is adjusted to the great plan of the universe*' (Grandgent 1924, p 93). Such would be the significance of Copernicus' effective displacement of the Earth from its '*natural place at the corrupt centre*' (Kuhn 1957, p 112).

The Copernican revolution

Through the period of the assimilation of the Greeks during the 13th and 14th centuries, university scholars began

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reassessing the question of the theological possibility of the plurality of inhabited worlds (Koestler 1959; Hoskins 1997; Dick 1998). Both William of Ockham, and later Nicole Oresme, argued that the divine creation of alien worlds need not contradict Aristotelian law if they too became local 'gravitational' foci. Here lie the seeds of a truly decentralized cosmos, but neither pluralism nor modern science saw an awakening during the Middle Ages. It was the gradual acceptance of Copernicanism that sparked a scientific revolution impacting on all areas of human thought (Kuhn 1957; Stimson 1972; Beer & Strand 1975; Westman 1975; Blumberg 1987). The introduction of Copernican heliocentrism injected a new energy into the dormant concept of pluralism. By placing the Sun at the centre of the planetary system, and by relegating the position of the Earth to that of mere planet, Copernicus set in train a new revolution. A new physics was born and, as many have contested (Cohen 1961; Dick 1998), all discussions on cosmic pluralism since Copernicus echo the same refrain: '*if the Earth is a planet, then the planets may be Earths; if the Earth is not central, then neither is humanity*' (Dick 1996, p 15).

The reception of Aristotelians to Copernicanism was outrage. In the words of Arthur Koestler (1959, p 433):

> '*there existed a powerful body of men whose hostility to* (*Copernicanism*) *never abated: the Aristotelians at the universities. The inertia of the human mind and its resistance to innovation are most clearly demonstrated not, as one might expect, by the ignorant mass – which is easily swayed once its imagination is caught – but by professionals with a vested interest in tradition and in the monopoly of learning. Innovation is a twofold threat to academic mediocrities: it endangers their oracular authority, and it evokes the deeper fear that their whole, laboriously constructed edifice might collapse. The academic backwoodsmen have been the curse of genius from Aristarchus to Darwin and Freud: they stretch, a solid phalanx of pedantic mediocrities, across the centuries.*'

Even among the Copernican propagandists themselves there was some understandable caution. As Thomas Kuhn (1957, p 193) has indicated, once pluralism was taken seriously, it provided huge problems for Christianity:

> '*If the Earth were merely one of six planets, how were the stories of the Fall and of the Salvation, with their immense bearing on Christian life, to be preserved? If there were other bodies essentially like the Earth, God's goodness would surely necessitate that they, too, be inhabited. But if there were men on other planets, how could they be descendants of Adam and Eve, and how could they have inherited the original sin, made for him by a good and omnipotent deity? Again, how could men on other planets know of the Saviour who opened to them the possibility of eternal life? Or, if the Earth is a planet and therefore a celestial body located away from the centre of the universe, what becomes of man's intermediate but focal position between the devils and the angels? If the Earth, as a planet, participates in the nature of celestial bodies, it cannot be a sink of iniquity from which man will long to escape to the divine purity of the heavens. Nor can the heavens be a suitable abode for God if they participate in the evils and imperfection so clearly visible on a planetary Earth. Worst of all, if the universe is infinite, as many of the later Copernicans thought, where can God's Throne be located? In an infinite universe, how is man to find God or God man? These questions have answers. But the answers were not easily achieved ….*'

In addition, as early as 1611 English poet John Donne realized the potential of the revived pluralism when he said to the Copernicans '*those opinions of yours may very well be true … creeping into every man's mind*' (Donne 1929, p 365).

For his belief in pluralism, along with other alleged heresies, the Roman Catholic Church burned one such Copernican, Giordano Bruno, at the stake in 1600. Bruno had published a form of cosmic pluralism in his *On the Infinite Universe and Worlds* (1584) arguing metaphysical unity as his source. The introduction of telescopic observation as corroborating evidence for theory began the, still unresolved, attempts at empirically verifying the Copernican premise of Earth-like planets.

Every important cosmology of the 17th century and later holds Copernicanism, and pluralism, as a fundamental notion. In 1686, Bernard le Bovier de Fontenelle published his *Conversations on the Plurality of Worlds*, which became imbedded in the Western European consciousness, in which he used Copernican and Cartesian perspectives in support of the extraterrestrial hypothesis. In 1698, Christian Huygens added his considerable weight to the debate with his *Cosmotheoros, Or, Conjectures Concerning the Celestial Earths and their Adornments*, and Cyrano de Bergerac, Voltaire, Kant and Laplace also became advocates of the extraterrestrial hypothesis (Sagan & Shklovskii 1966).

Ultimately pluralism became ingrained in the Newtonian synthesis. Even though it became increasingly apparent to some that natural law obviated the necessity for a Deity, the extraterrestrial hypothesis was subsumed by Newton and used as proof of God's glory. Such a universe, governed by natural philosophy and seeded with intelligence throughout by divine power, has survived in some form today. However, even though this particular form of extraterrestrialism was tempered with theism through the Newtonian synthesis, it did not lead to a general acceptance by Christianity – '*structures of insects or solar systems may evidence God's existence, but they are mute as to a Messiah*' (Crowe 1986, p 162).

Darwinism and extraterrestrialism

So despite some attempts at reconciliation, and the acceptance of the extraterrestrial hypothesis in some religions such as Mormonism and Seventh-Day Adventism, any resolution with Christianity, especially after Darwin, proved elusive. Six years before Darwin was forced to publish his theory through A.R. Wallace's co-discovery, William Whewell published one of the most intelligent, influential and strident cases yet against the plurality of inhabited worlds. Whewell's theme created much debate, but signalled little weakening

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of endorsement for the extraterrestrial hypothesis among scientists of the 19th century. Besides, another revolution was about to shake society to its foundations and breathe new life back into pluralism.

Key to the advancement of the extraterrestrial hypothesis in the 20th century was the scientific revolution of the 1860s. Darwin's theory of evolution not only gave credence to the development of life under alien conditions, it also initiated the possibility of physical cosmic evolution. The rise of spectroscopic methods transformed astronomy into astrophysics (Hoskins 1997), and led to empirical evidence that natural law was indeed harmonized throughout the universe, placing the physical dynamic of the extraterrestrial hypothesis on a sounder footing. As with Copernicanism before it, Darwinism transfused lifeblood into extraterrestrialism. It revolutionized our cosmic perspective, suggesting that life was a fundamental property of the universe.

French astronomer Camille Flammarion was almost evangelical in his support for pluralism, exercising a massive influence on 20th century attitudes to the idea (Sagan & Shklovskii 1966; Dick 1996). Just three years after the publication of Darwin's theory, Flammarion released his *La Pluralité des Mondes Habités* (Plurality of Inhabited Worlds). Over the next 20 years or so, 33 editions of *La Pluralité* were published, a clear indication of the contemporary popularity of extraterrestrialism. Flammarion argued, with some enthusiasm, that alien life, originating spontaneously rather than divinely, evolved through natural selection in its respective extraterrestrial environment. Essentially, anthropocentrism was cast out, and planet Earth and its inhabitants relegated to a lowly rung on the evolutionary cosmic chain of being, a theme we will meet later in the British science fiction of Wells, Stapledon and Clarke.

Throughout the development of the scientific strengthening of the case for the extraterrestrial hypothesis, we must remember that there is, however, conflict with other prominent concepts. As we have seen, the emotional and anthropocentric question of our place and position in the cosmos is woven into any discussion on pluralism. And during the 20th century the dialectic between anthropocentrism and pluralism was revolutionized time and again by stunning discoveries in astronomy and cosmology. Through the progress of relativity and quantum theory, and the maturation of the standard model of an expanding universe, the idea of an anthropocentric cosmos resting on our unique and privileged position in space–time became more and more preposterous. Instead, cosmologists developed the 'cosmological principle'. Based on the application of the Theory of General Relativity to the large-scale structure of the Universe, the principle, simply stated, suggests there is no special place in the universe, and is otherwise and often known as the 'assumption of mediocrity'.

Interestingly, however, one could argue that a robust case for the cosmological principle could not be made until physical discoveries, such as the fireball relic of the big bang, the cosmic microwave background (CMB) in 1965 (Thaddeus 1972; Sunyaev & Zel'dovich 1980; Weiss 1980; White *et al.* 1994) or the confirmation of the Zel'dovich–Harrison spectrum in the CMB in 1989 (Peebles 1980), finally established cosmology as a science, and the big bang as its standard cosmological model. In the meantime, the parallel development of two theories of cosmogenesis, the big bang and the steady state, enjoyed a symbiotic relationship with science fiction both pre- and post-war. In this way, the 'assumption of mediocrity' became a latent precept of the plurality of inhabited worlds, and advocates of the idea, both in science fact and fiction of the 20th century, embraced an entire cosmology.

The fictional development of the extraterrestrial hypothesis

Not until late in the 19th century did extraterrestrialism seriously find its way into fiction. Notwithstanding its currency as a developing belief since Copernicus, no one could have predicted that this idea would spark one of the universal motifs of 20th century fiction: the concept of the alien. As a result, an increasing number of people met pluralism, not through physics, but as a text, inspiring emotional as well as intellectual reactions and embedding the concept even deeper into the public psyche. As Isaacs (1977, p 6) reminds us, the creative transformation of scientific ideas into artistic symbols and metaphors of the human condition:

> '*is often an unconscious and therefore particularly valuable reflection of the assumptions and attitudes held by society. By virtue of its ability to project and dramatise, science fiction has been a particularly effective, and perhaps for many readers the only, means for generating concern and thought about the social, philosophical and moral consequences of scientific progress*'.

And since scientists are creatures of the culture in which they swim, alien contact narratives motivated a significant number of scientists, establishing pluralism in the scientific as well as the popular imagination.

The Darwinian theory of evolution gave credence, then, not just to the evolution of life on Earth, but also to the physical evolution of worlds in a cosmic setting. Darwin inspired a wealth of fiction (Henkin 1963), but moreover provided a fictional rationale for imagining what cosmic life might develop. From now on the idea of plurality became synonymous with the physical and mental characteristics of the alien, establishing, for the first time, a composite extraterrestrialism.

First encounter: Wells

Despite Kepler's Selenites and Voltaire's mile-high Sirians, the modern alien with its distinctive physiology and intellect owes almost everything to Darwin. This is most clearly exemplified by the case of H.G. Wells and his 1898 novel *War of the Worlds* (*WOTW*). First serialized in 1897 at the same time as the publication of Kurd Lasswitz's book *Auf Zwei Planeten* (On Two Planets), Wells arguably produced the first prototype of the personification of extraterrestrialism in

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devising not just the first alien fiction, but also the first 'menace from space'. Wells' foremost scientific influences in producing his book were evolutionary theory and pluralism. Wells had a direct link to Darwin through T.H. Huxley (champion of evolutionary theory, often known as 'Darwin's Bulldog') who taught Wells from 1883 to 1886 at the Royal College of Science in London. In addition, Wells was well aware of pluralism through the works of Kepler, Richard Proctor, Flammarion and, perhaps most importantly of all, Percival Lowell, whose spurious Mars contention had recently reached Europe. Indeed, Wells had contributed to the extraterrestrial hypothesis discussion as early as 1888 when he addressed the Royal College of Science's Debate Society on the topic of *Are the Planets Habitable?*, subsequently writing a number of essays in its support up to the publication of *WOTW* ten years later. Consequently, rather than being a capricious work of fiction, *WOTW* repeatedly reminds us of our insignificance in an immense universe along with our implied relegation on the new-found cosmic chain of being – '*minds that are to our minds as ours are to the beasts that perish*' (Wells 1998, p 7).

The impact of Wells' work cannot be over-estimated. Inspiration of many imitations, *WOTW* signals both the origin of the contemporary alien idea in fiction, and its subsequent currency in the public imagination. Wells was largely responsible for introducing the science-fictional nexus of the new concept, armed with its potential for probing human evolution. In addition, Wells' early books '*are, in their degree, myths; and Mr Wells is a myth-maker*' (Isaacs 1977, p 19). Once developed, the alien idea proved a potent motif for fictional explorations of the singularity or insignificance of humanity cultivated by the extraterrestrial hypothesis. Truly, during such explorations the secondary question of the character of alien and interspecies interaction became an issue, which later affected the SETI programme.

Second encounter: Stapledon

One of the foremost poets of such progress was British philosopher Olaf Stapledon. Based in Liverpool, Stapledon used the alien idea both to highlight the new perspective on humanity afforded by pluralism, and to investigate the philosophical, spiritual and scientific issues arising, in two key works: *Last and First Men* (1930) and *Star Maker* (1937). In his preface to *Last and First Men*, Stapledon informs the reader that the narrative is an attempt '*to see the human race in its cosmic setting, and to mould our hearts to entertain new values*' (Stapledon 1930, p xiii). In a telling evocation of both evolutionary theory and pluralism, he suggests that such attempts to extrapolate man's evolutionary future '*must take into account whatever contemporary science has to say about man's own nature and his physical environment*' (Stapledon 1930, p xv–xvi). Stapledon produced a fiction that incorporated the most recent ideas of astronomy and evolutionary biology, and synthesized a new form of myth apposite to a sceptical and scientifically cultured 20th century. In the words of Stapledon himself, the aim must not be just '*to create aesthetically admirable fiction, but myth*' (Isaacs 1977, p 25).

As with *Last and First Men*, the presence of the alien in *Star Maker* is, again in the words of Stapledon himself, to '*explore the depths of the physical universe*' and to '*discover what part life and mind were actually playing among the stars*' (Isaacs 1977, p 25). The contemporary setting in which *Star Maker* was conceived had undergone a further, although more silent, cosmological revolution. It was not until the late 1950s that astronomers started drawing analogies between profound revolutions in the cosmological worldview and the impact of discovering extraterrestrial intelligence (Dick 1993). Stapledon was 20 years ahead of the game. It has been suggested (Shapley 1958) that alien contact would represent 'The Fourth Adjustment' in humanity's outlook, following the shift to the geocentric, heliocentric and 'galactocentric' worldviews. This latter revolution, hastened by discoveries showing that our local solar system was merely at the edge of our Galaxy and that the Galaxy itself was but one of many, was made just prior to the time Stapledon was writing *Star Maker*. Astronomy had undergone great revolutions (Struve 1961), the Copernican and galactocentric revolutions, as well as Hubble's discovery of an expanding cosmos of island universes. However, there was one massive upheaval yet to come: the extraterrestrial hypothesis embodied in the question 'Are We alone in the Universe?' The revolution had already begun with Stapledon. By the mid-1920s, revolutions, including Copernicus, Darwin and Einstein, may have inured the masses to marginalization (Berenzden 1975). Stapledon was preparing the public for the final great demotion, and in the process helped develop the myth of the close encounter of the third kind: physical contact.

In *Star Maker*, alien biologies, together with terrestrials, search for the supreme intelligence in the new universe. Stapledon's narrative can be clearly interpreted as an exploration of extraterrestrialism and the quest for the spirit of the cosmos, an entity at the head of a new, and cosmic, great chain of being. In an early evocation of the implicit inhumanity of the new universe, he writes '*it was becoming clear to us that if the cosmos had any lord at all, he was not that spirit* [*God*], *but some other, whose purpose in creating the endless fountain of worlds was not fatherly toward the beings that he made, but alien, inhuman, dark*' (Isaacs 1977, p 25). Stapledon's fiction, then, emphasized the triviality of humanity in the face of a new and vast cosmos, which itself may harbour truths and meaning as yet unknown to an immature terrestrial race. His fiction on the question of intellectual contact with alien bio-logies had great influence on working scientists, such as exobiologist J.B.S. Haldane and Carl Sagan, one of the founders of the scientific search program SETI in the early 1960s, and fiction writers such as Arthur C. Clarke and Fred Hoyle.

UFOs and the extraterrestrial hypotheis

In the post-Stapledon period, the development of the extraterrestrial hypothesis took an unexpected twist with the rise of the 'flying saucer'. According to proponents of unidentified flying object (UFO) lore (von Daniken 1971; Vallee 1976), visitations of alien spacecraft had occurred over many

centuries, but only then were we beginning to recognize the phenomenon. Such investigators may be presenting 'evidence' based upon hindsight and pet theories rather than the sceptical method, but these examinations are instructive in that they allow the less partisan mind to probe the core and development of their case. The genesis of the modern UFO phenomenon derives from three major sources: the late 19th century great 'Airship scares' in the United States; pilot reports during World War II, when so-called 'Foo-fighters' were occasionally encountered by allied airmen; and the Arnold sighting near Mt Rainier, Washington State in 1947. Whilst all three cases obviously have rational explanations, the latter is of particular interest due to the essential part played by the media in the propagation of the UFO myth, and its subsequent inclusion in a strengthening extraterrestrialism.

Kenneth Arnold's account (Brookesmith 1996) of his 1947 sighting of nine crescent-shaped craft was overstated by one of the press reporters, who launched the term 'flying saucer' after eliciting details of their flight pattern from Arnold himself. In his write up, William Bequette of United Press not only exaggerated the craft's speed, but also equated the elusive ship with little green men invading the Earth, sparking the spread of the UFO hysteria. Subsequent media hype and intrigue further enhanced the idea of UFOs as saucers, wedding the extraterrestrial hypothesis to their reports. The phenomenon was further strengthened by 'typical' sightings, usually single persons encountering an unexplained light in the night sky, or having unsubstantiated visitations later linked to the extraterrestrial hypothesis by the reporting media. These cases have been fostered so widely that our culture is now replete with stories of spaceships, UFOs and malevolent aliens. And, of course, the myth and the expectation of the third encounter had been shaped by visionaries such as Stapledon and Clarke.

Investigation of such UFO phenomena took place in the political climate of the 1950s and 1960s: the Cold War era of McCarthyist anti-communist witch-hunts, the conspiratorial House of Un-American Activities, and the escalation of involvement in both Korea and Vietnam. During that period the UFO phenomenon prevailed due to vociferous efforts of writers and broadcasters, such as Frank Scully (1950), Donald Keyhoe (1952), George Adamski (1956) and Eric von Daniken (1971), aided and abetted by wave after wave of UFO sightings during the formative of years of UFOlogy. Such accounts have kept UFOlogy alive, and buoyed the extraterrestrial hypothesis, by augmenting sightings with contentious and sensational claims of government cover-up and conspiracy that have popular appeal. Robert Sheaffer (1974) has alluded to the increasing popularity of melodramatic theories and the extraterrestrial hypothesis. Sensational hypotheses, such as those contiguous with the UFO culture, generate such levels of interest that they tend to become self-sustaining, quite apart from the question of whether or not they are true. The self-sustaining nature of such ideas, and their replication, augmentation and perpetuation in popular culture, has ensured the synonymy of UFOlogy with extraterrestrialism in an association that becomes difficult to separate.

Another reason for the success of the UFOlogy is its intimate association with religious encounters and supernatural experiences: '*What we see in the UFO culture seems to be an expression, in the quasi-technological language appropriate to our space age, of ancient supernatural beliefs*' (Davies 1995, p 87). Many people favour UFOlogy because they '*draw comfort from the belief that advanced beings in the sky are watching over us and may some day intervene in our affairs and save us from human folly*' (p 86). Some sense of a religious quest may well extend to many SETI scientists who may be seeking '*some measure of comfort and inspiration*' (p 89) in view of the prevailing consensus, expressed by Nobel Prize-winning physicist Steven Weinberg, that '*the more the universe seems comprehensible, the more it also seems pointless*' (Weinberg 1977, p 154). Many posit that intelligence, whatever else its characteristics, is likely to be purposeful by definition.

Those researchers who were able to investigate the phenomena from a rational viewpoint dismissed the evidence in a series of reports such as *Project Grudge* (1951), the *Robinson Report* (CIA File, 1953), *Project Blue Book* (1959, final report 1969) and the *Condon Report* (1968). The wave-like nature of UFO sightings can be better understood as a consequence of media attention. In the following, we should be attentive to any correlation of the peaks in such sightings with parallel developments in the popularity of the fiction of Clarke, and the initiation of the SETI program.

Indeed, various commentators (Randles & Warrington 1979; Spencer 1989) have highlighted the relationship between UFO sightings, the boom of science fiction cinema of the 1950s and its associated dissemination. Evidence of this cultural tracking has been investigated by Mark Pilkington (2000) in an analysis that follows the development of the saucer/craft motif in UFOlogy along with a veritable wealth of 1950s movies such as *The Thing* (1951), *The Day the Earth Stood Still* (1951), *Invaders from Mars* (1952), *War of the Worlds* (1953), *It Came from Outer Space* (1953), *This Island Earth* (1955) and *Invasion of the Body Snatchers* (1956). This corollary also typifies the reflexive nature of science fiction itself, with its conscious preparing the common mentality for the outlandish, futuristic or possible through its promotion of the extraterrestrial hypothesis.

Third encounter: Clarke, and the SETI program

So, much more than science itself, the fictional and mythical elaborations of extraterrestrialism, through its co-adapted alien and UFO themes, defines the pervasive position of the idea in popular culture today. Heavily influenced by Stapledon, Clarke's 1953 novel *Childhood's End* is an archetype of the way in which alien fiction developed extraterrestrialism still further. Clarke had already written a number of short stories on the alien motif. The influential *The City and the Stars* portrays humanity confronted with extraterrestrial cultures and intelligences: '*he could understand but not match, and here and there he encountered minds which would soon have passed*

altogether beyond his comprehension (Clarke 1956, p 174). In *Childhood's End* Clarke further developed the myth of contact through an alien invasion of 'Overlords' benevolently responsible for guiding humanity to an even greater intelligence; the Overmind. Clarke uses the extraterrestrial and alien motifs once more to highlight humanity's immaturity in an aged universe. The Overlords exact an end to poverty, ignorance, war and self-government in preparation for the final destiny of humanity: Earth's children are sacrificed and united within the collective of the Overmind.

In the words of Clarke himself:

> '*the idea that we are the only intelligent creatures in a cosmos of a hundred billion galaxies is so preposterous that there are very few astronomers today who would take it seriously. It is safest to assume, therefore, that they are out there and to consider the manner in which this fact may impinge upon human society*' (Clarke 1972b, p 89).

Childhood's End was written amidst growing claims for inexhaustible exoplanetary systems, although empirical evidence for such extrasolar bodies was not discovered until 1995, and currently is still not beyond dispute or without alternative explanation.

The novel, and indeed much of Clarke's fiction, reflects his scientific belief in extraterrestrialism and the speculation of eventual contact. Interestingly, in the preface of a 1990 reprint and partial re-write of *Childhood's End*, Clarke attempts to disentangle the paranormal and UFOlogy from the extraterrestrial hypothesis underlining the original narrative:

> '*I would be greatly distressed if this book contributed still further to the seduction of the gullible, now cynically exploited by all the media. Bookstores, news-stands and airwaves are all polluted with mind-rotting bilge about UFOs, psychic powers, astrology, pyramid energies … Does this mean that Childhood's End, which deals both with the paranormal and visitors from space, no longer has any relevance? Not in the least! … I have little doubt that the Universe is teeming with life. SETI is now a fully accepted department of astronomy. The fact that it is still a science without a subject should be neither surprising nor disappointing. It is only within half a human lifetime that we have possessed the technology to listen to the stars*' (Clarke 1990, p 8).

In the wake of the massive popularity of both fiction and the myth of contact, Frank Drake became the first radio astronomer to scientifically contemplate the form and mode of transmission of an alien signal. In a seminal conference at Greenbank in 1960, he not only formulated the scientific reasons for searching for alien intelligence, but also became the first human to listen to the stars in an effort to pick up extraneous signals from another world. The now famed 'Drake equation' postulates a broad pattern of events that are the pre-requisites for the development of life, intelligence and communicative ability. One of the outcomes of this conference was Project Ozma (1960), where two sun-like stars, Tau Ceti and Epsilon Eridani, were examined in an effort to locate intelligent signals coming from occupants of any hypothetical planets the systems may contain. This search was followed single-handedly by project Communication with Extraterrestrial Intelligence (CETI 1964) until other scientists began to consider the logic of the search and to design larger and farther-reaching listening programmes utilizing the largest radio telescopes on Earth. The publication of *Intelligent Life in the Universe* by Carl Sagan and Iosef Shklovskii in 1966 heralded the mainstream scientific introduction of the plausibility of alien intelligence in the cosmos by inputting the entire field with objective credibility and sound proofs taken from the whole range of relevant science disciplines. Indeed, Sagan later developed a fictional exploration of radio alien contact in his 1985 novel *Contact* and its excellent cinematic counterpart (1997). Both are grounded in Sagan's real-life experience of the scientific search, but fictionally portray humanity's destiny among culturally and intellectually superior extraterrestrials.

However, it was Arthur C. Clarke himself who was instrumental, in the second half of the 20th century, in developing the extraterrestrialism for the mass market. Even though the imaginative and innovative flood and sweep of the alien theme in fiction is impressive, as far as the propagation of the extraterrestrial hypothesis is concerned, it was the reworking of representative examples of such fiction, particularly that of Clarke, for the cinema that accelerated the process even further. Of course, the extraterrestrial hypothesis and its associated exploration of humanity and the cosmos could be examined through fiction without the alien, but the inclusion of the alien seems to have been extraterrestrialism's defining moment in the public imagination. And such fiction would have remained marginalized were it not for the opening up of the genre to film and television.

Arthur C. Clarke and Stanley Kubrick's *2001: A Space Odyssey* was delivered during the peak of the extraterrestrial hypothesis between 1966 and 1969 (Dick 1996). Famed for the maturity of its portrayal of mysterious, existential and elusive aliens, *2001* raised science fiction cinema to a new level, and the film, not the book, made Clarke the most popular science fiction writer in the world. Kubrick's film, which made dramatic, but subtle, use of the alien theme, quickly became a classic discussed by many, if not understood by all. Perhaps the key to the underlying theme to *2001* can be learned from the book of Clarke's and Kubrick's screenplay:

> '*Almost certainly there is enough land in the sky to give every member of the human species, back to the first apeman, his own private, world-sized heaven, or hell. How many of those potential heavens and hells are now inhabited and, by what manner of creatures, we have no way of guessing; the very nearest is a million times further away than Mars or Venus, those still remote goals of the next generation. But the barriers of distance are crumbling; one day we shall meet our equals, or our masters, among the stars*' (Clarke 1972a, p 7).

Conclusion

In the course of the 20th century development on the debate of the existence of extraterrestrial life and intelligence,

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science and science fiction enjoyed an increasingly symbiotic relationship. Not only did pluralism find a voice in fiction through the alien, but fiction also inspired science to broach questions in the real world. The myth and the associated expectation of the third encounter, developed through fictional accounts by Wells, Stapledon and Clarke, influenced the development the UFO phenomena, which in turn further transformed and strengthened extraterrestrialism.

Progress in cosmology and astronomy notwithstanding, science still has little to say on the nature, psychology and intelligence of alien life. The revolution of the imagination that has transformed the original idea of a plurality of inhabited worlds into today's pervasive cultural myth of extraterrestrialism is largely due to the fictional development of extraterrestrial themes. Even in science, information dissemination through society is a critical factor in the development and implementation of concepts and how these concepts become accepted or incorporated into personal belief systems. The fictional stories and contact myths inspired many of the pioneers in astrobiology and SETI.

A final influence may also be identified. Through its emphasis on arguments of physical determinism dictated by the cosmology at the bedrock of pluralism, fictional accounts have usually been positioned firmly in the pro-SETI, pro-life camp of the extraterrestrial life debate, swaying an entire generation of future SETI-hunters as a result. However, in the last 20 years or so, pioneers of the evolutionary synthesis, such as Simpson, Dobzhansky and Mayr, have emphasized how physical scientists and fictional accounts still think along deterministic lines, while an evolutionist is impressed by the incredible improbability of intelligent life ever to have evolved, even on Earth. As Loren Eisley (1957) concludes:

> '*So deep is the conviction that there must be life out there beyond the dark, one thinks that if they are more advanced than ourselves they may come across space at any moment, perhaps in our generation. Later, contemplating the infinity of time, one wonders if perchance their messages came long ago, hurtling into the swamp muck of the steaming coal forests, the bright projectile clambered over by hissing reptiles, and the delicate instruments running mindlessly down with no report … in the nature of life and in the principles of evolution we have had our answer. Of men elsewhere, and beyond, there will be none forever*' (Sagan and Shklovskii 1966, p 432).

Given the complexity of the study of cosmic and terrestrial evolution, and the propensity of random process over design, it is incredible to realize that millions have been spent in the second half of the 20th century on sober scientific projects in the search for extraterrestrial intelligence. There can be no greater testament to the power of the empirical method and the imaginative sway of fiction than the fact that they have influenced such deeply held convictions on the nature of the universe.

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