

Dail W. Mullins, Jr.

School of Education and Honors Program
University of Alabama at Birmingham
Birmingham AL 35294, USA

THE MYTHOLOGY OF WESTERN SCIENTIFIC MATERIALISM AND THE RISE OF THE EVOLUTIONARY EPIC

1. HUMAN EVOLUTION AND THE ORIGINS OF EXISTENTIAL AWARENESS

*The price we pay for anticipation of the future is anxiety about it.
Man is probably the only organism on Earth with a relatively clear
view of the inevitability of his own end.* Carl Sagan

In the opening "Dawn of man" sequence from his 1968 film "2001: A space Odyssey", director Stanley Kubrick asks us to imagine that our species acquired its capacities for both tool use and violence as the result of a kind of brush with the epiphany – in this case a dead of night visitation from an extraterrestrial intelligence (deity?) which, in the form of a mysterious and inscrutable obelisk, transformed our gentle australopithecine ancestors into club-wielding killers. These new traits (as we are reminded through the remarkable image of a sun-bleached bone thrown high into the air suddenly transforming itself into an orbiting space vehicle) are similarly envisioned by Kubrick to be seminal forces in the evolutionary ascendance of our kind to eventual mastery not only of the planet itself but of ignorance as well.

There are several interesting and provocative myths at play in Kubrick's cinematic narrative of the events surrounding our transition from frightened hominids huddled together in the darkness of the African savannah to makers of footprints in the lunar dust at Tranquillity Base. One of these, certainly of most recent vintage, is the notion that our species owes its evolutionary successes mainly to a propensity for violence, aggression, and the use of weapons. This kind of thinking no doubt owes much to the ideas of Raymond Dart (1959), a South African anatomist who discovered the first *Australopithecus* (3-1.5 MYA) remains in 1924 (the famous "Taung baby"),

and whose interpretation of compressed bone accumulations in rock cavities led him to suggest that early hominids were hunters of such aggressive nature that they often murdered their own kind.

This chilling scenario, however, was subsequently appropriated by an American playwright turned amateur naturalist, Robert Ardrey, who wrote a series of popular books during the 1960s and 1970s, including "African genesis" (1961); "The territorial imperative" (1966); "The social contract" (1970); and "The hunting hypothesis" (1976) and to whose writings we can perhaps more directly trace the origins of this notion of early man as a killing machine:

Not in innocence, and not in Asia, was mankind born. [In Africa] we came about on a sky-swept savannah glowing with menace (...) we held in our hand the weapon the legacy bequeathed us by those killer apes, our immediate forbears. We are Cain's children [predators] whose natural instinct is to kill with a weapon. The sudden addition of an enlarged brain to the equipment of an armed already-successful predatory animal created the human being (Ardrey 1961).

In his brief review of Ardrey's works, science writer and encyclopediast Richard Milner attributes their extraordinary success and popularity to several factors, not the least of which was that their author "bolstered his arguments with a dramatist's vivid imagery [and] fantasy" (Milner 1990). The public found fascinating his presentation of ideas and discoveries – among them the "near-man" fossils found by Dart in Africa, as well as recent research in animal social behavior and territoriality – which had previously not spread beyond the more tempered ruminations of scientific circles.

Most primatologists and paleontologists today place little credence in Ardrey's ideas, based as they are on the now discredited speculations of Raymond Dart about australopithecine cannibalism as well as unsubstantiated parallels drawn – often by Ardrey himself – between the behavior of contemporary savannah primates (e.g., baboons) and that of early hominids. On the contrary, most modern students of human evolution now believe that our australopithecine and *Homo habilis* (2-1.6 MYA) ancestors, far from being vicious hunters (they were simply too small, weak and slow for this role), probably obtained most of the meat in their diets through scavenging and owed their eventual success more to increased intelligence, cooperation, and social interaction than to skill behind the knife and club (Blumenschine & Cavallo, 1992).

A second myth apparent in Kubrick's tale, and one not unrelated to the first, is the notion that tool use itself originated with our hominid ancestors and that it was this trait, perhaps more than any other, which served to distinguish our kind from the scrambling menagerie of other ground and tree-dwelling primates with which we shared the forests and savannah of east central

Africa. Because the use of tools, whether found or fashioned, enabled our ancestors to enter previously inaccessible environments, some philosophers have speculated – as perhaps some progressive theologians have hoped – that this characteristic may have liberated our kind from the normal constraints of biological evolution (Milner 1990).

Studies by field ethologists over the past several decades, however, have revealed that tool use – and most importantly, perhaps, *learned* tool use – is a widespread phenomenon within the animal kingdom, having been observed in a variety of birds, coastal marine mammals, and other primates. Even the hopes of those who suggested that it was tool *making* rather than simple use which distinguished our kind from other creatures had such opinions shattered by anthropologist Jane Goodall's frequent observations of tool fashioning by chimpanzees in Africa (Goodall 1971). Indeed, if there is any special trait to be assigned to us in this regard it is that human beings may be the only creatures who *use* tools to *make* tools. This would seem to be a distinction of such fine magnitude, however, as to be largely lost on those who might demand a more conspicuous and qualitative difference to be demonstrated between ourselves and the "fallen sparrows" of the world.

Yet another myth, age-old and familiar to most people through any one of a number of religious traditions throughout the world, posits itself as a central theme not only in Kubrick's opening scenes but throughout his quasi-mystical film. This is the notion of a human nature which, while perhaps forged on an anvil of innocence and possibly even grace, nevertheless finds itself invariably corrupted by outside forces quite beyond its control. In Kubrick's mind, as perhaps in most connotations of this idea, corruption of our species comes about through the intervention of a supernatural force or being – a mysterious and menacing obelisk, perhaps, or a coiled serpent in the garden of original bliss – which leads our kind into a state of fallen grace through a temptational act which takes advantage of our extraordinary curiosity.

It is probable that this most familiar of myths – familiar because of its near universality among human cultures – owes its existence to the appearance within our species of what can probably best be described as a moral conscience and the subsequent need of humans to deal with perceived "moral discrepancies" within their own behavior and even within their amoral (i.e., natural) surroundings. Indeed, in some later religious traditions – most notably, perhaps, the Judeo-Christian faith – this myth is appropriated as the very source of both moral intuition and our unavoidable transgressions thereof (Sagan 1977).

As is the case with the use and fashioning of tools and weapons, however, it seems likely that moral consciousness is not an absolute trait by which we can

easily isolate ourselves from the uncomfortable commonality of animal existence. Guilt and shame, pride and prejudice – or at least their nascent evolutionary antecedents – have long been apparent to those familiar with a variety of domesticated creatures, our own suspect anthropomorphic tendencies notwithstanding. Canine pets, for example, may be conditioned to avoid certain practices out of a simple fear of disapproval, but one would be hard-pressed to draw a marked distinction between a dog's anticipatory "fear" of such reprisal and the "guilt" felt by a tax-cheater conditioned through society's rules to be honest. Likewise, in human cultures, societal rules of "proper" conduct are often codified and made apparent to all through the medium of ritualistic behavior, which also seems to have its *learned* evolutionary precursor among the activities of some non-human primates – most notably the rain and waterfall ceremonies of east central African chimpanzees (Goodall 1971).

It is almost axiomatic in paleontological research that behavior leaves no fossils. This is true, of course, only insofar as past behaviors do not involve a manipulation of the physical environment which could conceivably leave behind clues for future scientific historians. While it will surely be impossible for us ever to determine when it was that innate (i.e., non-conditioned) feelings of guilt and remorse might have first visited themselves upon us (indeed, if they are even unique to our kind), this is not the case for other and perhaps equally important behavioral innovations, such as the controlled use of fire. Unearthed circles of stone, blackened on their interior surfaces by heat and smoke and surrounding the fossilized remains of charred wood and bone, for example, make it quite clear that an earlier human species, *Homo erectus* (1.6-0.4 MYA), was already well familiar with fire and its several beneficial effects (Leakey & Lewin 1977; Sagan 1977).

Similarly, we can speculate as to when it was that early humans – in this case our Neanderthal ancestors, *Homo sapiens neandertalensis* (75,000-30,000 years ago) – might have had their own first "brush with the epiphany," at least based upon a remarkable discovery made by Columbia University paleontologist Ralph Solecki (1957) during the mid-1950s at a site called Shanidar Cave, 250 miles north of Baghdad, Iraq.

Within the cave [Solecki] hit bedrock at a depth of forty-five feet. Seven Neanderthal skeletons were found, three of them the remains of people crushed to death by falling rocks. At least one of the individuals, a man with a badly crushed skull, was buried deep in the cave with special ceremony. One spring day about 60,000 years ago members of his family went out into the hills, picked masses of wild flowers, and made a bed of them on the ground, a resting place for the deceased. Other flowers were probably laid on top of his grave (Milner 1990).

At another Neanderthal site, Le Moustier in France, an adolescent male was found buried on his side with his head resting on folded arms and a pile of flints; a beautiful stone ax lay near his hand and the corpse was surrounded by the bones of wild cattle. At yet another locale called Teshik Tash in central Asia, a small child was discovered buried with "six pairs of ibex horns arranged in a ring around his head" (Pfeiffer 1972; Milner 1990).

These ice-age funerary sites, and many other locales housing evidence of Neanderthal ritualistic and cultic activity scattered throughout Europe, Asia and the Middle East, suggest that sometime between 75,000 and 30,000 years ago, human beings underwent an extraordinary and altogether inexplicable transition in their attitudes and beliefs about themselves, their surroundings, and their individual fates.

Death, and presumably life, had become something special. No comparable evidence appears in earlier records, and as far as we know, men and the ancestors of men had always died like other animals before Neanderthal times, being abandoned when they were too weak to keep up with the band or wandering off to wait alone for the end to come. Burial implies a new kind of concern for the individual...[and] Neanderthal man invented, or at least formalized, illusion when he invented burial. The belief in an afterlife says in effect that death is not what it seems; that it represents an apparent ending only, an ending only as far as the evidence of the senses is concerned; and that in this case, the crude evidence of the senses is wrong (Pfeiffer 1972).

It was, if not exactly a moment of epiphany in human history, at least a remarkable transition in existential awareness; the belief that "reality involves not observed and observable 'facts' but an abstraction, the idea that death is actually a passage from one world to another" (Pfeiffer 1972). Pfeiffer believes that in this respect "the burial ceremonies of prehistoric hunters expressed the kind of thinking used today to develop theories about the structure of the atomic nucleus or the expanding universe" (Pfeiffer 1972). If so, then it is surely the height of historical coincidence and irony that these more contemporary abstractions should now have presented us, nearly fifty thousand years later, with what might almost be interpreted as a kind of reversal of the feelings of existential importance and self-worth encountered by our Neanderthal ancestors.

2. AN AWAKENING IN IONIA

Timeo Danaos et dona ferentes
(I fear the Greeks, even when they bring gifts).

Virgil

In 1930, in the preface to the fourth edition of his book "Early Greek philosophy", the British philosopher and historian, John Burnet wrote: "it is an adequate description of science to say that it is 'thinking about the world in the Greek way'. That is why science has never existed except among peoples who came under the influence of Greece" (Burnet 1930). While such a statement may seem too callously ethnocentric in today's climate of heightened cultural awareness and sensitivity, it is nevertheless the case that the philosophical underpinnings of contemporary scientific materialism – what physicist Erwin Schrödinger described as "the peculiarity of the scientific world-view" – can be traced with some certainty to the Ionian natural philosophers of the 6th and 5th centuries BC (Schrödinger 1956).

For thousands of years humans were oppressed – as some of us still are – by the notion that the universe is a marionette whose strings are pulled by a god or gods, unseen and inscrutable. Then, 2,500 years ago, there was a glorious awakening in Ionia: on Samos and the other nearby Greek colonies that grew up among the islands and inlets of the busy eastern Aegean Sea. Suddenly there were people who believed that every-thing was made of atoms; that human beings and other animals had sprung from simpler forms; that diseases were not caused by demons or the gods; that the Earth was only a planet going around the Sun. And that the stars were very far away (Sagan 1980).

Because of the extreme paucity of writings from this period, it seems unlikely that we will ever be able to fully reconstruct the intricacies of intellectual thought and exchange which led to the Ionian break from the mythological animism which had characterized human cosmogonies since at least the time of the Neanderthals. Prior to Thales of Miletus, who is typically credited with having initiated the revolution in Greek thought through his many rumored achievements in mathematics, astronomy and engineering, human beings appear to have attributed most naturally occurring phenomena – and especially dramatic events such as storms, floods, earthquakes and droughts – to the only cause with which they must have had any real familiarity: the volitional acts of individuals. This association, coupled with the virtual necessity of having to imagine such volitional acts as being "human-like" in their nature, led to the near universal development of deified cosmologies (i.e., religions) which saw few patterns in the natural world save those which could

be rationalized through the anthropomorphic projection of emotion and mood onto a controlling god or gods – anger and capriciousness, jealousy and love, mischievousness and humor.

Given this then-prevalent view of the universe as "marionette" (Sagan 1980), one cannot help but be impressed by the curious combination of arrogance and courage which must have characterized the heretical notions of Thales and his followers: not only in the formulation of those ideas which stood to antagonize the sensibilities of others – a risk which would lead ultimately to the executions of Socrates and Giordano Bruno for, among other things, religious heresies – but also in those thoughts and reflections which must have been personally discomfiting, given the lack of any certain knowledge about the possible divine consequences of such intellectual insurrection. On the other hand, it also seems clear that the Ionians, despite such radical thoughts, never had it in mind to do away altogether with the concept of the divinely unpredictable, but only the notion that the machinations of the natural world could be understood solely within the context of such. "Men think epilepsy divine, merely because they do not understand it", wrote Hippocrates of Cos. "But if they called everything divine which they do not understand, why, there would be no end to divine things" (Sagan 1980).

In establishing, however informally, their novel ideas about the natural world and the nature of reality, the ancient Greeks came to rely on two fundamental assumptions which may properly be viewed as philosophical extensions of Euclid's mathematical axioms – statements of first principles which, while perhaps intuitively obvious to most, must nevertheless be accepted as fundamentally unprovable tenets. According to the interpretation of Schrödinger (1956), these two critical assumptions included: (1) the hypothesis of comprehensibility, by which is meant the notion that the universe is knowable; that it is governed by natural laws which are regular and invariant; that we can discover these laws; and that, once discovered, they will be comprehensible to us; and (2) the hypothesis of objectivation, by which it is assumed that the "cognizing subject" attempting to discover and comprehend these natural laws is only an observer and, for all intents and purposes, can be "dispensed with" in the final picture of the universe aspired to.

While these two "axioms" of Ionian scientific materialism may beg for comment and discussion – certainly in Schrödinger's mind as much as anyone's – it is not the intent here to engage in a philosophical disputation of their relative merits or deficiencies, but rather to underscore the fact that these simple statements of belief in an ordered design and comprehensibility to the universe broke sharply and decisively with, among other things, a pattern of existential awareness much older than the Ionian Greeks could possibly have

imagined. The intellectual secession from animism which characterized the Ionian revolution was, like the simple graves at Shanidar, an epiphanic moment in human history.

Apart from the singular exception of Socrates – whose trial and subsequent sentence of death may have been prompted as much by political intrigue as by accusations of heretical teachings and ideas (Harris & Levey 1975) – there is little in the historical record to suggest that the confrontation between mythological animism and Ionian materialism resulted in significant existential or eschatological problems for the Greeks. On the contrary, as Schrödinger (1956) has argued, the philosophical climate of ancient Greece seems strangely to have fostered a kind of search for compatibility between the differing notions of reality which then existed among the new society of materialistic determinists (atomists), on the one hand, and the more traditional metaphysicists, on the other.

There were, of course, widely diverging opinions, combating one another with no less fervour, and occasionally with no more honourable means than elsewhere and at other periods. [But] never before or since, anywhere in the world, has anything like [the Greeks'] highly advanced and articulated system of knowledge and speculation been established *without* the fateful division [between science and religion] which has hampered us for centuries and has become unendurable in our days (Schrödinger 1956).

Why this should have been so for these people appears to be a matter of some speculation. Isaac Asimov has suggested that the intellectual compatibility of natural and metaphysical philosophies enjoyed by the Ionians may have stemmed in part from the fact that the Greek philosophers tended to view philosophical thought and argumentation in general as little more than an intellectual sport or game; part of a superior-minded "cult of uselessness" which rejected mundane knowledge (such as might be acquired through experimentation or measurement) and "preferred to relegate all [such] practical matters to slaves" (Asimov 1979). By this view, one supposes, eschatological inconsistencies might simply have been regarded as either annoying distractions or, at best, irrelevant to the spirit of the "game".

A somewhat more prosaic but altogether more interesting and perhaps convincing idea is supplied by Schrödinger, who argues that, while there were no apparent limitations placed on the subjects about which a learned Ionian philosopher might be permitted by his peers to give an opinion, "it was still agreed that the true subject was essentially one, and that important conclusions reached about any part of it could, and as a rule would, bear on almost every other part. The idea of delimitation [of knowledge] in water-tight compartments had not yet sprung up" (Schrödinger 1956).

This attitude was no doubt reinforced through the Greek fondness for deductive logic and its absolute dependence upon a priori first principles which, because of their presumed inerrancy, provided a kind of philosophical boundary beyond which further debate might have seemed absurd or frivolous. More to the point perhaps is the fact that the first and foremost Aristotelian principles of Greek natural philosophy – that the Earth is motionless and located at the center of a universe which is everywhere else in regular and perfect circular motion – obviously served to reinforce those arguments from metaphysics and moral philosophy which were designed to perpetuate and bolster notions of the existential importance and innate ethical nature of the human (or at least terrestrial) condition. Alas, it was these very first principles which, when later scrutinized with the same kind of abstract thought so apparent at Shanidar Cave, proved to be the undoing of both Western intellectual harmony and existential comfort.

3. FOUR SHOCKS: THE MYTHOLOGY OF WESTERN SCIENTIFIC MATERIALISM AND THE RISE OF THE EVOLUTIONARY EPIC

Nothing could be more obvious than that the earth is stable and unmovable, and that we are the center of the universe.

Modern Western science takes its beginning from the denial of this commonsense axiom.

Daniel J. Boorstin

The more the universe seems comprehensible, the more it also seems pointless.

Steven Weinberg

The tradition of Western scientific materialism – invented by the Ionian Greeks, lost for a time during the so-called "dark ages", and then rediscovered by European natural philosophers during the fourteenth and fifteenth centuries – has thus far presented our kind with no less than four major challenges to its existential sensibilities. These include, in the order of their appearance on the intellectual landscape: (1) an empirical model of a heliocentric "universe" (i.e., the solar system), first put forth by the Polish astronomer Nicholas Copernicus in 1543, which removed us, both literally and figuratively, from the center of all things (Pasachoff 1985); (2) Charles Darwin's theory of evolution by natural selection (1859), which proposed that all life forms on Earth, including human beings, exist only as a kind of statistical consequence of a series of chance mutational events, amoral but untiring natural selection processes, and very little else (Appleman 1979); (3) the Oparin-Haldane model (heterotrophic

hypothesis) for the origin of life on Earth – an idea first advanced by the Soviet geologist A.I. Oparin in 1924 and, independently, by the British biologist J.B.S. Haldane five years later – which more or less substantiates Darwin's "small, warm pond" scenario, but now bolstered by a more rigorous and detailed understanding of Precambrian chemical, geologic and atmospheric processes (Bernal 1967; S. Miller, personal communication); and (4) Big Bang cosmology (1927-1965), which can be viewed, on the one hand, as comfortably accommodating many religious notions of a past "creation" event for the universe (Pasachoff 1985) but which also demands, as a kind of "fine print" corollary, an acceptance of the fact that this same universe now face a "future extinction of (...) endless cold or intolerable heat" (Weinberg 1988).

Marvin Minsky, professor of computer science at the Massachusetts Institute of Technology and a pioneering influence in the field of artificial, or machine, intelligence, once remarked that it is "the nature of human beings that it takes us a long time to absorb an existential shock" (Minsky 1989). Indeed, time does seem to be a major factor in our ability, both as individuals and as a society, to "cope" with knowledge or convincing materialistic models of the natural world which may elicit existential apprehension. It has been nearly 400 years since Giordano Bruno was burned at the stake for too-vociferously promoting the Copernican notion of a sun-centered solar system – time enough, it would seem, for most individuals to have adjusted to this existential shock.

Evolution, and especially the idea of probabilistic and non-directed natural selection, of course, is another matter altogether, and the 130 years which have elapsed since the publication of Darwin's theory have clearly not been enough to quell the existential unease prompted in us by his insightful ideas. This fact is perhaps underscored best by demographer Jon Miller's (1987) most recently published survey results of science literacy among the adult American public, which reveal that nearly half of all such respondents do not "believe" in evolution.

The Oparin-Haldane theory (heterotrophic hypothesis) for the origin of life on earth – sometimes called the Miller-Urey model after the two scientists who, in 1953, first put the idea to a successful experimental test (S. Miller 1953; Urey 1963) – is perhaps too recent, if not too technical in its formulation and thesis, to have had much impact yet on the non-science public and its existential concerns. Like the theory of evolution by natural selection, however, contemporary origin of life science treads uncomfortably close to what many no doubt perceive to be the sanctum sanctorum of existential meaning and purpose: the notion of life itself (and certainly conscious life) as a kind of "miracle of matter" which transcends physico-chemical explanation and so

perhaps "passeth all understanding." Continued theoretical refinements of the Oparin-Haldane model, though, together with expected experimental confirmation of its proposed avenues of Precambrian molecular evolution, early cell formation, and the spontaneous appearance of genetic coding mechanisms, could in time lead to the kind of intellectual and existential estrangement on the part of the public so apparent today with respect to biological evolution by natural selection.

Big Bang cosmology as a source of existential apprehension or confusion is an interesting and perhaps unusual case. Like the Oparin-Haldane (Miller-Urey) model for the origin of life, it is perhaps too recent to be fairly judged in this regard; the whole scientific notion of a "beginning" to the universe is only now approaching its seventieth year. Likewise, modern cosmology – particularly since the advent of efforts to merge particle physics and quantum theory with phenomena like galactic expansion and clumping – has proven to be somewhat beyond the intellectual grasp or apparent interest of the non-science public (not to mention many scientists outside the community of cosmological physicists). But the scientific notion of a "beginning" to things at all seems so welcome to many of the "existentially embattled" that Weinberg's uncomfortable post-origin conditions for the universe – "death" by cold or heat – have been largely overlooked in deference to wonder about the creation event itself.

These four benchmark ideas in the development of the tradition of Western natural philosophy – and possibly including as well the nebular hypothesis for the origin of the solar system, first put forth by Immanuel Kant in the late eighteenth century (Pasachoff 1985) – together constitute what E.O. Wilson has referred to as the core of the mythology of scientific materialism: the Evolutionary Epic.

Let me repeat its minimum claims: that the laws of the physical sciences are consistent with those of the biological and social sciences and can be linked in chains of causal explanation; that life and mind have a physical basis; that the world as we know it has evolved from earlier worlds obedient to the same laws; and that the visible universe today is everywhere subject to these materialist explanations. [The narrative form of this mythology is] the epic: the evolution of the universe from the big bang of fifteen billion years ago through the origin of the elements and celestial bodies to the beginnings of life on earth. While explaining the biological sources of religious emotional strength, [this mythology] is unable in its present form to draw on them, because the evolutionary epic denies immortality to the individual and divine privilege to the society, and it suggests only an existential meaning for the human species (Wilson 1978).

By "mythology", of course, Wilson means simply to refer to any grand narrative by which human beings attempt to explain themselves and their place in the proverbial "grand scheme of things". In short, such mythological

narratives are the means by which we strive to find eschatological meaning in our lives. Heretofore, Wilson contends, these mythologies have been predominantly religious in nature – and quite often animistic – by which it can be inferred that they have been almost universally constructed to support and promote our (perhaps commonsensical) notions of centrality, self-importance and self-worth, all the while placing ultimate meaning and fate in the hands of "a god or gods, unseen and inscrutable" (Sagan 1980). The mythology of Western scientific materialism, on the other hand, is perhaps distinguished most by its marked departure from these themes, instead seeming to concentrate less on comfortable illusions and more on cosmogenic scenarios which, while perhaps provoking awe and wonder far in excess of that provided by any religious mythological narrative, also result in some considerable measure of existential discomfort.

In the closing paragraphs of his book "The first three minutes", Steven Weinberg (1988) remarks: "It is almost irresistible for humans to believe that we have some special relation to the universe, that human life is not just a more-or-less farcical outcome of a chain of accidents reaching back to the first three minutes, but that we were somehow built in from the beginning". If true, then our present "irresistible" need for such comforting mythological narratives – what Wilson (1978) believes to be an innate and "ineradicable mythopoeic requirement of the [human] mind" – conceivably had its origins with the funerary rites of *Homo neandertalensis* and their invention (formalization) of the notion that human life, or at least our conscious awareness of existence, somehow and in some inexplicable way manages to transcend death. It is this faith in transcendence which seems to set us truly apart and, clearly for many, renders existence both meaningful and, perhaps, ultimately enduring. Existential apprehension, then, may arise whenever other ideas or constructs of reality, such as are presented by the evolutionary epic of scientific materialism, appear to conflict with the demands and catechisms of this religious construct.

In a 1985 survey for the National Science Foundation of science literacy among the adult American public, Jon Miller arrived at some disconcerting conclusions about the effects that our culture's burgeoning dependence on, and affiliation with, contemporary science seems to be having on those individuals in our society who are least knowledgeable about the content and methodologies of that science: high school dropouts and, to a similar extent, those who possess only a high school diploma. Together, these two groups comprise sixty-two percent of the adult American population, or nearly ninety-five million people. For such persons, Miller wrote, "the world is [viewed as] a strange, hostile, and somewhat dangerous place. This group has a strong

sense that it lives within an incomprehensible system [and that] it has little control over its fate" (J. Miller 1987).

Nowhere was the evidence for confusion and uncertainty among this group more clearly or poignantly illustrated than in Miller's findings with respect to their attitudes and beliefs toward a variety of "pseudoscientific" topics and trends. Forty-two percent of this group, for example, believes that astrology is scientific, and nearly half of these individuals report routinely changing their plans in deference to this belief; fifty-three percent believe that some numbers are especially "lucky" for some people; an equal percentage do not believe in evolution; and thirty-three percent agree (or are inclined to agree) with the statement that "it is not wise to plan ahead because many things turn out to be a matter of good or bad luck anyway". When asked if "scientific researchers have a power that makes them dangerous", nearly sixty percent of those with only a high school diploma, and seventy-one percent of high school dropouts, agreed. These latter figures appear to mask an even greater confusion about such matters, however, since similar percentages of both groups believe that "in this complicated world of ours, the only way [to] know what is going on is to rely on leaders and experts who can be trusted" (J. Miller 1987).

Miller's own concerns about these issues – and presumably those of the National Science Foundation – relate, of course, to the question of what such findings may portend for the political and economic future of democratic societies which are becoming increasingly dependent upon science and technology. "The threats to [these systems] from a scientifically illiterate electorate are many, ranging from the danger of political demagoguery to the decay of the entire democratic process as vital decisions that effect everyone have to be made by an educated (but probably unelected) elite" (Hazen & Trefil 1991). It seems as likely, however, that the existential and eschatological views of a considerable proportion of our population may also be at issue here, and with equally important and unpredictable consequences for our culture.

References

- Appleman P. ed. (1979), Darwin, New York: Norton.
- Ardrey, R. (1961), African genesis, London: Collins.
- Asimov I. (1979), Opus 200, New York: Dell.
- Bernal J.D. (1967), The origin of life, Cleveland: World.
- Blumenschine R.J., Cavallo J.A. (1992), Scavenging and human evolution, "Scientific American" October, p. 70-76.
- Burnet J. (1930), Early Greek philosophy, London: A. & C. Black.
- Dart R. (1959), Adventures with the missing link, New York: Viking.
- Goodall J. (1971), The shadow of man, New York: Dell.
- Harris W.H., Levey J.S. eds. (1975), The new Columbia encyclopedia. New York: Columbia University Press.
- Hazen R., Trefil J. (1991), Science matters. Achieving scientific literacy, New York: Doubleday.
- Leakey R.E., Lewin R. (1977), Origins, New York: Dutton.
- Miller J. (1987), The scientifically illiterate, "American Demographics" v. 9, p. 26-30
- Miller S.L. (1953), A production of amino acids under possible primitive earth conditions, "Science" v. 117, p. 528-529.
- Milner R. (1990), The encyclopedia of evolution, New York: Facts On File.
- Minsky M. (1989), Artificial intelligence comes of age, "Discover" March, p. 39-41.
- Pasachoff J. (1985), Contemporary astronomy, New York: Saunders.
- Pfeiffer J.E. (1972), The emergence of man, New York: Harper & Row.
- Sagan C. (1977), The dragons of Eden, New York: Random House.
- Sagan C. (1980), Cosmos, New York: Random House.
- Schrödinger E. (1956), On the peculiarity of the scientific world-view, in: What is life? New York: Doubleday.
- Solecki R.S. (1957), Shanidar cave "Scientific American" November, p. 58-64.
- Urey H.C. (1963). The origin of organic molecules, in: J.M. Allen (ed.), The nature of biological diversity, McGraw-Hill: New York, p. 64-78.
- Weinberg S. (1988), The first three minutes, New York: Basic Books.
- Wilson E.O. (1978), On human nature, Cambridge MA: Harvard University Press.