God, Darwin, and the Planet

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MICHELANGELO'S CREATIONis among the most important celebrations of Genesis. Rendered on the domed ceiling of the Sistine chapel in Rome, the painting swirls overhead in a glorious composition of line and color. It crackles with the dynamism, the wonder, and the power of that moment when Adam rose up from the earth under the forefinger of God. The representation clearly defines the ultimate cause of all things: they emanate from an all powerful creator. Furthermore, that forefinger links us forever to His divine plan. All under it are the players ordained to live according to His scenario. That is our purpose, and that is the meaning of all existence.

Is Michelangelo's a valid view?

In general terms, Creation must be a valid view in so far as it is an expression of the artist's inner vision and speaks to all of us in the majesty of its scale, the harmonies of color and line, and of the passions that attend such ideas. But is Creation valid in other areas, for example, in its content? Yes it is, if you are willing to accept the story of Genesis on faith alone. But if you chose to weigh validity through science - the answer is no. And if that is the case then is life without a transcendent principle, without purpose, and without meaning?

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In the following, I shall come down on the side of science and argue that the fundamental premise of Creation is invalid. I shall also argue that the application of science to the problem will also yield a plenary principle from which meaning and purpose in life can follow.

Science

Science scrutinizes reality with the resounding faith that all phenomena will eventually yield to the logic of its incisive methodology. The method involves the reduction of observations to hypotheses and subjecting the hypotheses to tests. Hypotheses are plausible explanations of observations and predictions. The test is an objective analysis set-up to weigh the hypothesis either by controlled experiments or by congruence with history!. Finally, the evidence derived from experiment must be presented to the scientific community *via* reputable scientific publications in which everyone interested can examine the experiment and its ramifications, discuss and debate the methods and the findings. The hypothesis must hold against the weight of its supporting data and stand up to the heat of the debate. If it does not, then changes are in order.

Hypotheses that have weathered the storms of scrutiny by the scientific community and that remain in force after repeated testing from all quarters become theories. And theories that prove particularly useful and have gained wide acceptance become paradigms2. Creation was one such paradigm.

The theme of Creation could not hold up because it violates fundamental premises of science. For example, the balanced harmonies - the form of the figures, their placement with respect to each other, the way everything fits - convey a message of perfection, of symmetry and balance, that God is the ultimate perfection and all that flows from His hand is perfect too. However, the fact remains that if such perfection and symmetry were with us from the start, matter would have annihilated itself early on, and there would not have been any Adams at all.

We are immersed in a universe richly endowed with substance, and the reason for this rather fortunate condition is the presence of a fundamental flaw, an asymmetry in how matter interacts with antimatter3. If perfect

1 Stephen Jay Gould, "Evolution and the Triumph of Homology, or Why History Matters," *Amencan Scientist,* 74 (1986) 60-69. DalWin did not do any expenments to support his case for evolution *by* natural selection. It was, indeed, a triumph of homology.

2 Thomas S. Kuhn, *The Structure of Scientific RevolutIOns,* (Chicago, 1970).

3 For every particle of matter in the solar system there is'a potential counterpart in antimatter. Both matter and antimatter are identical to each other in most respects except charge. Thus an electron with a negative charge has an anti-electron (a positron) mate that can be generated

symmetry applied both should annihilate each other almost completely. Because of the flaw, however, the matter-antimatter pairs that existed in equal amounts shortly after the big bang did not completely destroy one another. Some survivors remained after the last of the cataclysmic encounters, and everything, all the galaxies, the planets, and people stand today as the heirs to that fundamental asymmetry in nature4.

There is another type of asymmetry present in living things, namely in the spatial array of the atoms in their constituent molecules5. Although many of the carbohydrates and the amino acids (subunits for proteins) can exist in two alternative forms, just one, and only one of them can be used in life. So fundamental is this asymmetry that practically anything that lives will use the same form of the molecule.

Spontaneous Generation

As fundamental as the symmetry problem is, there are still more direct problems. Creation implies that fully formed life, with all the complexity of the human species would suddenly rise up out of the dust, without delay, and without the benefit of parents. The sudden birth of complex organisms, known as spontaneous generation, was the prevailing paradigm in Michelangelo's time. In those days, everyone knew that vermin were born out of sweat and filth, and that all sorts of creatures oozed out of the cracks in old walls, from all orders of mud and vapors rising over the heaps of dung and offal that accumulated everywhere. And just a few grains of wheat wrapped in a dirty chemise would surely get you very nice mice by the morning.

The doctrine of spontaneous generation held sway for thousands of years before it was finally laid to rest through the application of the scientific method. The death blow came in the middle of the last century and is commonly attributed to Louis Pasteur. Well, it was pretty well on the way out before then. Pasteur usually gets the credit because he wrote the definitive review on the matter, and so exerted spin control over history;.

under certain conditions.

4 James Cronin and Val Fitch won the Nobel in Physics, 1980, for their demonstration of the asymmetry in the decay of certain elementary particles. For an accessible treatment of the phenomenon see Robert A Adair, "A Flaw in the Universal Mirror," *Scientific Amcncan, 258,* (1988),50-56.

5 Many molecules occur in two forms: the spatial array of the atoms in one is the mirror image of the array in the other.

6 As carefully documented by John *Farley,The Spontaneous Generation Controversy from Decartes to Oparin,* (Baltimore, 1977).

Biogenesis

If spontaneous generation does not apply now it must have been applicable in the very beginning for how else could life have originated when there were no parents around. And if there were no parents what was the cause?

An external cause need not be invoked to foster the appearance of life. Matter carries sufficient cause within itself. It was inevitable that matter should eventually take on the properties of life as it increased in complexity in the milieu of the primordial earth. But spontaneous generation need not be used as the process. Spontaneous generation implies that life appeared *suddenly*. Life is too complex to come this way. It is entirely too improbable that everything necessary would suddenly leap together by some cosmic stroke of luck and begin to dance off upon the primordial floor of creation. Creation was slow and very gradual. The origin of life took a billion years by the gradual convening of all the necessary parts. I have called the process Biogenesis and supplied many of the details in an earlier papers.

Suffice it to say that the first stage in the emergence of life probably occurred when ordinary chemical reactions transformed strategic raw materials into the more complex precursors for the living substance. The raw materials were probably atmospheric gases, among them carbon dioxide and nitrogen vented out of volcanos from deep in the middle of the earth9. The gases were released as the great heat down there melted and metamorphosed rocks of a certain composition. Once that happened the process of weathering could begin to wash out more carbon dioxide through the action of water on surface rocks much as the gas is released from baking soda by the acid in sour milk [10]. The carbon dioxide became the backbone for the essential organic molecules that would eventually form the living substance. We are by this means inextricably bound to the rocks in the landscape. The landscape is within us and we are in it. I shall return to this point later.

In any case products that would be used to assemble living things were made through ordinary chemical reactions. Nothing special need be invoked, just the kinds of interactions that occur as readily as iron rusts,

7 Sidney Fox, *The Emergence of Life,* (New York, 1988).
8 Laurence Levine, "Biogenesis", *Humanism Today,* 4 (1988) 78-104.
9 The earliest atmosphere on the primordial earth was probably blown away by solar winds and replaced by a secomfary mantle of gases that originated from the ground. See Richard A Kerr, "Origins of Life: New Ingredients Suggested," *Sczence,* 219, (1980), 42-43.
10 Geologists call the sweating out process metamorphic/magmatic breakdown of carbonate rocks. For recent articles that treat the geochemical carbon dioxide cycle see:. Robert A Berner and Antonio C. LaSaga, "Modeling tlte Geochemical Carbon Cvcle," *Scientific American,* 260 (1989), 74-81. James F. Kasting, Owen B. Toon and James B. Pollack, "How Climate Evolved on Terrestrial Planets," *Scientific American,* 258 (1988) 90-97.

milk curdles, or colors fade 11. Eventually, (life appeared about one billion years after earth formed) compounds formed relatively complex assemblies that were capable of self-replication. At this point, the organizations could be called protocells, just rudiments by today's standards, but, once organized to this level, they could evolve to the complexity and perfection we know today.

Biological Evolution12

It is without question that the key to understanding how complex life could develop from the simplest precursors, resides in some relatively simple ideas that began with Charles Darwin over a century ago.

We know that the earliest forms of life were the simplest and most uniform. There were no such things as plants or animals - just stripped down versions of today's archaebacteria (something like the ones that live in the large intestine and produce gas). These potent germs come closest to the ancestors of the entire web of existence. They would give rise to life's rich gamut of form and function, fill five kingdoms, and cover the earth with a rich, vibrant, swelling mantle of interlocking dependencies. Darwin's theory of evolution explains how life got to be this way from its simple beginnings, how time and circumstances shaped the world of life on earth.

The creative force in evolution is the range of hereditable variations in populations generated by the plasticity of the genes. The DNA is inexorably driven by the motor of change. Genes mutate. They shift slightly in composition, duplicate, jump around to new locations, enter new combinations. That is why organisms come to differ from each other (unless they are identical twins with identical genes). As we shall see, some of the changes may not be expressed immediately but they do, nevertheless, add to the potentials for the future. Some of the modifications do finally surface and organisms come to vary in every facet, in stature and shape, the density of their bones, the length of their limbs. They may also vary in ability to withstand stress, to resist infection, and in many other ways. Any context of such variation fuels natural selection.

Natural selection is the foundation of Darwinian evolution. It is the context of environmental circumstances that determines which varia-

11 This last example is especially instructive because it involves the interaction of light and matter in analogy with how organic matter enters the world of life today by means of photosynthesis.

12 See also Sherri L. DeFauw, "Evolution: The Highlights," *Humanism Today*,*3* (1987), 39-46; G. Ledyard Stebbins and Francisco J. Ayala, "The Evolution of Darwinism," *Scit:ntific American,* 253 (1985), 72-82.

tions shall persist in future populations. The fly, swift enough to beat the swatter, will, in all probability, survive long enough to reproduce itself. It will influence future generations for its "swifter" genes will continue to increase as its descendents squeak by the swatter, and the populations of its descendents will, on the whole, become improved by at least that much.

Natural selection continually adjusts the frequency of heritable variations in populations. It ensures that the favorable variations will persist as surely as it operates to weed out the unfavorable ones. It molds genetic potential and continually hones it to adapt most closely to the demands of the environment. The race belongs to the swift.

But what is being selected? The genes[13], of course, but never directly. Selection gets to genes through their products, or, in the parlance of the biologists, through their phenotypes. So the swift population carries swift genes with swift phenotypes whatever they may be: fast muscles, the ability to sense the rush of the swatter while it is in its pre-swat phase. A parallel situation in other populations may well be a heavy pigmentation phenotype which shields harmful solar radiation and increases the probability of living longer than their lesser pigmented contemporaries. These kinds of genes are subject to direct selection. But, gene changes can be neutral (that is, be without phenotypes) when their compositions change in certain ways. These genes then become silent partners. They are carried along with the others, replicate with them, silently drifting, accumulating variations, waiting in the wings, so to speak, until that day when the accumulated changes happen to have survival value[14]. Then they may find their voice and may even steal the ShOW[15].

There is a special case of selection that appears (on the surface) to have favored the retention of adaptations *without* survival value. Let us return to the fly again to illustrate the point. Suppose that instead of escaping the fly actually responded to the swatter by buzzing to attract attention to itself and then by deliberately slowing down to take the hit. The result would have been one less fly in the world, an apparent reversal of selection, and more of a de-selection. Yet this behavior, called altruism, has substantial

13 Some evolutionists argue for a less reductive unit of selection such as an overall pattern, a taxonomic gestalt. See, for example, Stephen Jay Gould, "DalWin and the Expansion of Evolutionary Theory," Science, 216 (1982),380-387; MaIjorie Grene, "Hierarchies in Biology," *American Scientist,* 75 (1987), 504-510.

14 Kimuro. Motoo, "The Neutral Theory of Molecular Evolution, *Scientific American, 241* (1979), 98-126. This theory holds that selection does not influence variation at the molecular level. Rather, selectively equivalent mutant genes drift along and eventually form adaptively significant contexts, sort of the molecular equivalent of "slouchmg towards Bethlehem."

15 DNA changes all the time. The rate or change averages out to a constant level so that it appears to "run" much like a clock, the molecular evolutionary clock (Jukes, Thomas, H, "Silent Nucleotide Substitutions and the Molecular Evolutionary Clock," *Science,* 210 [19801, 973-978; Roger Lewin, "Molecular Clocks Turn a Quarter Century," *Science.* 239, [1988],561-563).

evolutionary credentials. Altruism exists as an integral feature in the repertoire of established species.

Is the principle of natural selection, of the operation of the machinery to retain adaptations with the greatest survival value compromised by the evolution of altruistic behavior? Not necessarily, if the fly, by diverting the swat to itself had saved its family (who happened to be feeding nearby). The idea is that the loss of the one individual would have been offset by the preservation of the population of its closest kin, the repositories, so to speak, of many of the same genes. The one fly was sacrificed under the swatter but many of the same genes that made it such a super-fly were preserved in the survivors, its closest kin (see also note 21).

New Species

How does something new come about? As time progresses all sorts of selective pressures operate to foster the accumulation of the favorable variations within a subpopulation with the passing of each generation. Eventually, as variations build through time, the subpopulation will diverge more and more widely from the mainstream. When some form of reproductive barrier (a wide physical rift, a behavioral, anatomical or functional change) comes between potential mates in the divergent populations, isolation is complete. The isolates can then go their separate ways. When their reproductive isolation continues over a long period of time, it deepens into genetic isolation. When mixing through mating with other populations becomes more and more remote we see the emergence of a new species - a form holding an exclusive pool of genes.

The long term survival of the new species will depend upon its ability to adapt to the constantly changing environment. If sufficiently plastic and genetically malleable to the challenges from the competition for limited environmental resources, their potential can be enormous. The new species may well mean the beginning of a new hierarchy, another branch on the family tree, a Promethian spark in the tinder pile. Over the billions of years since life first emerged, the continual accumulation of new variations led to innovation upon innovation. Most of these eventually ran out of steam. They stiffened and lost the plasticity they needed to measure up to environmental stress, and, so, they became extinct. Some, however, continued to diverge to compound new buds on the tree of life from which new branches arose - to continue the process of beginning, of branching again, inexorably moving through the ages to the present. That must be how things became what they are today from the simplest beginnings. That is to say that the continual interplay of genetic variation and natural selection would have

yielded the entire present panorama of life, humans included.

The genetic context and the environmental circumstances that fostered humans dealt a unique suite of genes, those that would direct the development of a singular phenotype. A new kind of brain emerged, one capable of generating language, abstracting experience and capturing events in metaphors - a brain that also held the mind. That property added culture to the evolutionary equation, and with it came the development of societies and nations and a new dimension on the course of evolution itself.

Cultural Evolution

The advent of mind meant that ideas joined genes as agents for change. Create a hot idea in the fertile medium of the mind and it will take hold and expand. Lay it on others through language and it will spread like fire through the population and gather support and momentum along the way. Soon the frequency of the idea will increase in that population and become implanted in spoken and written language. It can change the way others think and the way they behave for a long time to come (Note the parallel here with biological evolution through genetic change. Ideas not genetic variation, become the currency of change; language, not necessarily reproduction, becomes the means of their transmission). Thus an idea can change the culture, and if it continues to have survival value, the idea should "survive" until something better comes along that will begin its train of new modifications. The society has therefore evolved one more notch, not necessarily through the classical operation of genetic variation and natural selection, but through the mechanism of mind, through the operation of consciousness in the medium of culture.

Thus cultural evolution can occur in record time. Equipped with their brains humans can alter their destiny without waiting for the sifting out of the fortunate genetic variation and their consequent spread through the population by their relatively slow generation time. They can do so much more rapidly through the application of reason and language. We are equipped to undergo cultural evolution and we have transformed the planet because of it16.

Michelangelo's Creation is a product of cultural evolution. Cultural evolution gave us the idea of God to come between and set humans apart from nature17 - "The harvest is in God's hands; He will intervene ... "

16 For further reading see: Richard Dawkins, *The Sclfish Gene,* (New York, 1976), 204-215; Lumsden, Charles J. and Edward O. Wilson, *Promethlan Fire* (Cambridge, Mass. 1983), 121. Wilson would say that cultural evolution is tempered by genetic constitution.
17 Native Amencans and Eastern religions do not set humans apart from rocks.

- and to give man a purpose as players in His divine plan. Western-type God-centered religions could have evolved when humans changed life-styles (e.g. from planters to shepherds) and discarded the ancient myths of immortality and rejuvenation. Among other things religion offers the *perception* that survival is possible despite death. Just adhere to God and to His plan - do all the "right" things and eternal salvation, everlasting life (meaning the most elemental form of survival) will await in the hereafter.1S

Survival is also in the lexicon of biological evolution. One of the most famous phrases from Darwin's time, "the *survival* of the fittest" is an apt description of natural selection itself. But survival is not *planned* by evolution.. Evolution has no plan *per se*.. It is simply driven by the interaction of *random* heritable variations with *randomly* fluctuating environmental circumstances. More likely than not, evolutionary modifications have led not to survival but to eventual extinction.

But matters have changed through the medium of mind. Survival *can* be planned, and, in fact, *is* planned. That is the strategy of cultural evolution. Compare longevity now with longevity at the time of Michelangelo. The outlook on earth was very bleak then. There were no vaccines for plague and small pox, polio and diphtheria, and many of the other scourges. There is no question that the medieval plagues have been thwarted if not eliminated through science. [19] Furthermore, much promise attends the technology of tissue and organ transplantation, and it will not be too long before cultural evolution shall directly intervene in biological evolution through genetic engineering and recombinant DNA technology.

But the unfortunate fact remains that there is a residuum left over from our many survival strategies. The specter of a nuclear holocaust rides on the horizon. We continue to burn fossil fuels and create the acid rains that sear woodlands, poison lakes and, even worse, the burning adds more carbon dioxide to the atmosphere to enhance the greenhouse effect. So there is also the specter of the famine and the upheaval that will result when the climate heats up as the green house effect deepens. In addition, we continue to use chlorofluorocarbons in such devices as air conditioners even though these compounds are implicated in the destruction of the stratospheric ozone layer. Loss of this umbrella will result in harmful ultraviolet radiations zapping all that lives on earth. And we are not yet finished. The

18 We do not know the origins of religion. Some have speculated (Joseph Campbell with Bill Moyers, *The Power of Myth*, [New York, 1988], 100) that religions began as an extension of shamanism, and that monotheism, the bulwark of Judeo-Christian traditions, arose in cultures living out in the open and under that great dome of the desert sky, or in shepherd societies with flocK and staff (reviewed by Edward O. Wilson, *Sociobiology*, [Cambridge, Mass., 1975] 559-562.). See also Levine, Laurence, "Biogenesis," Humanism Today, 4 (1988), 78-104.
19 Smallpox.is now eliminated.

tropics are being cleared of rainforests at a most alarming rate. We will never again recover from the enormous loss of genetic potential that will result when the last of those trees will fall.20 The bell is tolling now for all of us.

Meaning and Purpose

Let us consider that the present outcomes of biological evolution justify our subscribing to it as an over arching and a plenary principle from which to derive meaning and understanding of life. Nothing makes any sense unless we do so. And in doing so we shall also subscribe to life, not necessarily for the individual, but for the collective, the whole context of genes, which made life all that it is.

Our purpose in life will then follow. To endorse survival we must live with a heightened awareness that we no longer live immersed within a landscape that has endless possibilities to generate and sustain life. Nothing will grow in Chernobyl for a long time; cancer stalks the neighborhood toxic dump site; patches of tropical rain forests have reverted to desert. Let these examples serve as warnings that we can break the line of our descent from the rocks forever. We must therefore promote the understanding of our linkage to the planet in all quarters, burn less in the way of fossil fuels, banish chlorofluorocarbons, and save the tropical rain forests. Above all we must subscribe to the cultural equivalent of altruism21, certainly not to fall on our swords, but to put the planet first in all matters, before commerce, before creature comforts, before the bell is silenced forever.

In that case the forefinger in Michelangelo's creation becomes transformed - no less exalted, important, or powerful - it becomes our very own.

20 For excellent overviews of the dimensions of the rainforest trage~y and the issues see Catherine Caulfield, *In the Rainforest: Repon from a Strange, BeautiJU~ Imperiled World,* ChicagO, 1984), and Norman Myers, *The Primtiry Source: Tropical Forcsts and Our Future,* New York, 19S5).

&1 Some form of altruism must have operated in human evolution, for how could we have survived, at any stage, without helping each other? And some form of altruism must exist today. Governments award medals for extraordinary feats of self-sacrificing heroism, and you can also read accounts of lesser acts in the newspapers every day. Altruism does exist among humans. There does not seem to be much debate about that. There is a question, however, about the basis for the altruism. E.O. Wilson argues for genetic roots (see, for example, Edward O. Wilson, *Human Nature,* [Cambridge, Mass., 19781, 149-167; Charles J. Lumsden and Edward O. Wilson, *Promethian Fire,* [Cambndge, Mass., 19S3j), Others, however, debate this view, arguing that altruism is ruled not by genes but by custom transmitted by I'urely cultural routes down through the generations(see Stephen Jay Gould, "Biological Potentiality vs. Biological Determinism," In *Ever Since Darwin,* [New York, 1977],251-239). I have invoked altruism here for the self-sacrificing acts which must prevail because of what we know. Whether we are directly propelled into action by our genes or by our wits matters little in the context of the present essay.

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