lum will serve the scientific discipline, and varieties of religious belief systems, if they teach young minds to understand forthrightly that proper, orderly scientific activity is limited to the study of *natural* objects and/or events. Consequently, *discussions* of *un*natural concepts and first origin questions do not entail scientific studies or scientific theories. Rather *discussions* of *un*natural concepts and first origin questions entail sets of contrasting beliefs and the associated objective, scientific data that can be used, *after the fact*, to support *either* Total Evolutionism, *or* Total Creationism.

Again, modern teachers seeking to preserve the integrity of a pluralistic educational curriculum should understand that there is *no* "science" of creative acts that are accepted by Total Creationists; and likewise, there is *no* "science" of *un*natural changes that are accepted by Total Evolutionists. Yet significant amounts of objective, scientific data, as listed, can be used to support *either* of these two main contrasting viewpoints about first origin questions.

References

1. Rulings by Federal judges are limited to the jurisdiction of the judge. Thus the Judge Overton ruling in Arkansas pertained essentially to the litigation in Arkansas. Evidently, however, the mere suggestion of "legal blackmail" by organization personnel from outside public school systems has deterred some creative, innovative educators in many states with regard to teaching about origin questions.
2. Mayr, Ernst. 1978. Evolution. *Scientific American* 239: 45-55.
3. In debates and forums with evolutionary scientists proponents of Total Creationism find that a great number do not understand the wide scope of application of evolutionary ideas. Thus the article by Dr. Mayr is most instructive of the prevalent "real" situation.

   Many biologists especially do not seem to recognize the broad scope of Total Evolutionism. They attempt to separate concepts about the origin of life from "organic evolution," but their ambiguous use of the term "evolution" is a significant factor in their thinking. Many biologists believe that extrapolation from empirically demonstrated small changes of living organisms (genetic variation, which is called *micro*evolution by some scientists) substantiates belief in supposed large scale changes of organisms (specifically *macro*evolution or *mega*evolution) over immeasurable time. Such evolutionists fail to admit that all circumstantial evidence they employ to support their belief in *macro*evolution also may be interpreted as evidence in support of Total Creationism.
4. The justices of the U. S. Supreme Court have designated only three acts that violate the First Amendment in public schools: (1) state-required prayer—Engel v. Vitale, 370 U. S. 421 (1962); (2) state-required Bible reading—School District of Abington Township, Pa. v. Schempp, 374 U. S. 203 (1963); and (3) state-required on-premises religious training—McCollum v. Board of Education, 333 U. S. 203 (1948).
5. The following are representative: Simpson, G. G., *et al.* 1962. Notes on the nature of science. Harcourt, Brace and World, New York, p. 9 and Ayala, F. J. 1974. Biological evolution: natural selection or random walk? *American Scientist* 62:700.
6. Noteworthy is the needed understanding by all educators of the fact that the majority of scientists supporting Total Evolutionism are in a sense proponents of a philosophic outlook that might well be labelled the "Philosophy of *Un*naturalism." Total Evolutionists do *not* formulate "naturalistic" explanations, rather they offer imaginative, *un*naturalistic scenarios (stories, plays).
7. Actually, in the fullest sense of professionalism, Federal judges are not qualified to determine what is scientific, which was admitted publicly by a leading evolutionist educator at the 1982 National Association of Biology Teachers convention in Detroit. Only professional scientists with qualifications in specific areas are qualified to determine what is scientific in the respective areas of scientific study.

DID THE UNIVERSE START OUT STRUCTURED?

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Abstract

The problems of those cosmologies that assume a structureless initial state of the universe seem to make structured-origin models more promising and attractive.

Introduction

Since A. Penzias and R. Wilson discovered cosmic microwave background radiation in 1965, and even more so since S. Weinberg wrote his famous book *The First Three Minutes* in 1977, 'cosmology' has become almost synonymous with 'hot big-bang theory.' The so-called 'standard model' (or big bang) has forced all other concepts aside so that the proponents of other theories are hardly noticed.

One of the most important characteristics of the big-bang model is that it assumes a structureless beginning of the universe: either from a singularity which as such cannot have any structure, or from a completely homogeneous fireball having the same temperature, density, and composition everywhere. This lack of structure of the assumed initial state makes the model beguilingly simple; but this also appears to be its fatal defect.

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The Big-Bang Model

The standard model is based on theoretical work by A. Einstein (1917), A. Friedmann (1922), and G. Lemaitre (1927) on the general theory of relativity. It takes into account the observation of E. P. Hubble and M. L. Humason (1927) that the redshift of spectral lines from distant galaxies is largely proportional to the distances of these galaxies. Interpreting the redshifts as 'cosmological', i.e. as a consequence of the speed of recession due to an expansion of space, Hubble introduced the notion of a uniformly expanding universe. In 1948-49 G. Gamov, [1,2] R. A. Alpher, and R. Herman[3] set up the model of the primordial fireball or big bang. They predicted an electromagnetic background radiation having the spectrum of a black body with the temperature 5°K. A suitable microwave radiation of 3°K was detected 15 years later.

At first it was assumed that all chemical elements were created in the big bang. Later the theory had to be changed: only hydrogen, deuterium, helium, and

lithium were considered to stem from the primordial explosion. According to the model, galaxies formed in the first 10^9 years of the universe. The galactic matter condensed and gave rise to stars. The heavier chemical elements (^{8}Be-^{244}Pu) are believed to have been produced inside stars during their lifetime and in their explosion as supernova. The total age of the big-bang universe is estimated to be 10 to 20 billion years.

THE TWO PROOFS OF BIG BANG

The Redshift

The observed redshifts fall into two ranges: $\Delta\lambda/\lambda$ (relative wavelength-shift) $\equiv z < 0.4$ for galaxies and $z < 4$ for quasars. There are strong arguments that not all of the measured redshifts can be cosmological. There exist objects of very different redshifts which are physically associated in space: double stars, double galaxies, quasar and galaxy, double quasars, and triple quasars. G. Burbidge diagnoses:[4]

> I believe that however much many astronomers wish to disregard the evidence by insisting that the statistical arguments are not very good, or by taking the approach that absence of understanding is an argument against the existence of the effect {of noncosmological redshift}, it is there and many basic ideas have to be revised. A revolution is upon us whether or not we like it.

The nature of the noncosmological redshift is not yet clear; but even the cosmological component might be interpreted differently as 'aging' of light, energy loss of photons in curved space,[5] or photon-photon collisions. Detailed investigation by J.F. Nicoll and I. E. Segal[6] for galaxies having $z < 1/60$ showed a quadratic dependence of redshift from distance instead of the linear Hubble law. The authors conclude: "The Hubble law lacks an objective statistical foundation."

The Microwave Background

In 1948 Alpher and Herman[7] predicted the temperature of the microwave background to be 5°K. Already in 1926 A. S. Eddington had prophesied 3.2°K for the temperature of a radiation emitted by interstellar dust (the measured temperature is 2.7°K). Other effects might be important, e.g. synchrotron radiation or radiation from the nuclei of galaxies.

More recent measurements did not coincide with the spectrum expected by the big-bang cosmology. Hoyle notes:[9]

> The latest data differ by so much from what theory would suggest as to kill the big-bang cosmologies. But now, because the scientific world is emotionally attracted to the big-bang cosmologies, the data is ignored. What was sauce for the steady-state goose is not sauce for the big-bang gander.

Narlikar remarks:[10]

> This energy density is not too different from the energy densities observed in other astrophysical phenomena in the universe, such as starlight, cosmic rays, galactic magnetic fields and so on. Does this mean that the microwave background also is of astrophysical origin and not a relic of the big bang?

The microwave background is not the only isotropic background radiation. There also exists an isotropic X-ray background.[11] These backgrounds cannot both originate from a big bang. Since one of them came into being without the primordial fireball, the other one might have done so as well.

The common belief that the steady-state cosmology cannot explain the microwave background is no longer true. Hoyle states:[12]

> Earlier, when we tried in vain to explain the microwave background, we had assumed a spherical shape for all particles involved in the computations. But, if we suppose that the particles are needle-shaped we can explain the background radiation.

Since the interpretation of redshift and microwave background is not free of problems and since non-big-bang explanations exist for these phenomena, calling them 'the proofs of big bang' is not well founded.

Structureless Origin

The concept of an unstructured initial state has been built into the big-bang model on the basis of philosophical (egalitarian) or mathematical (simplicity) predilections. The 'cosmological principle' postulates that no place and no direction in the universe be distinguished from any other place or direction (homogeneity and isotropy).

If an initial state of extreme matter density is adopted, homogeneity becomes imperative for avoiding the formation of black holes and the disappearance of matter therein. The cosmological principle excludes initial electric or magnetic fields, electric currents, or rotations (angular momenta).

It has been observed[13] that the larger a system one considers the larger is, on the average, its angular momentum per mass (e.g. planetoid, planet, star, star cluster, galaxy, galaxy cluster, supercluster). This is exactly contrary to the prediction of the big-bang model.

Notable cosmologists point out that the cosmological principle does not match the structure of the actual universe. G. de Vaucouleurs[14] emphasizes that the cosmos has a hierarchical structure: stars being grouped into galaxies, galaxies into clusters of galaxies, clusters into superclusters, with indications of even higher levels. The largest structures, including giant voids, have dimensions of some percent of the observable universe. A map of a million galaxies shows quite clearly that one can tell one region of the universe from others even at very large scale. Alfvén writes:[15] "It is questioned whether the homogeneous four-dimensional big-bang model will survive in a universe of inhomogeneous three-dimensional structure."

In the structureless-origin models the formation of galaxies in the uniformly expanding gas is highly problematic. Hoyle[16] remarks:

> Even though outward speeds are maintained in a free explosion, internal motions are not. Internal motions die away adiabatically, and the expanding system becomes inert, which is exactly why the big-bang cosmologies lead to a universe that is dead-and-done-with almost from the beginning. . . . The notion that galaxies form, to be followed by an active astronomical history, is an illusion. Nothing forms, the thing is as dead as a doornail.

The Distribution of Chemical Elements

According to the big-bang model, chemical elements heavier than lithium that are present outside stars (in planets, comets, meteorites, dust, or gas) and at the

surface of stars should have been set free by supernova explosions. One would, therefore, expect an enrichment of such heavy elements in supernova remnants (SNRs). K. Davidson[17] searched for these chemicals in the best observable SNR, the Crab nebula, in the visible and ultraviolet bands of the spectrum. He ascertained that the explosion produced no extra oxygen at all, likewise no carbon, and no other elements except helium.

The big-bang theory teaches that the interstellar medium in a galaxy is constantly enriched in heavy elements. Therefore, stars that formed early in the galaxy's lifetime (old stars) should have a small concentration of heavy elements at their surface and vice versa for stars that formed late (young stars). This is contradicted by the fact that stars believed to be very young, like the Bo star τ Scorpii, and stars considered to be very old, like the red giant ε Virginis, and many other normal stars show the same chemical composition.

On the average there is one helium atom for every 12 hydrogen atoms in the universe (27 percent by weight). Less than one percent of this helium could have been synthesized in stars during 10^{10} years. Hence it is believed that this helium stems directly from the big bang. In this case it should be evenly distributed in the universe. This model is seriously questioned by the existence of some B stars[18] which have less than one percent of the average helium concentration. A similar inconsistency is reported by V. Rubin:[19]

> Astronomers were startled to learn that the hot intracluster gas {gas between the galaxies of a cluster}, identified by its X-ray emission, is not the pristine hydrogen and helium formed shortly after the Big Bang and left over after galaxy formation but is rich in heavy elements such as iron.

These observations indicate that the chemical structure of the universe is not what the big-bang cosmology predicts.

The Inflationary Scenario

When Weinberg popularized the standard model of big bang in 1977, he declared himself unable to approach the zero of time by less than 10^{-2} s. In 1980 A. H. Guth introduced an accessory theory, called 'inflation.'[20] His model describes the universe as far back as 10^{-35} s and in later versions even to 10^{-43} s. Inflation was invented in order to solve some of the problems of the standard model-problems which would have rendered the big bang completely implausible:

a) The 'horizon problem': The standard model could not explain why the microwave background radiation received from opposite directions of the sky has the same intensity and spectrum.

b) The 'flatness problem': The observed mass density of the universe differs from the 'critical density' (the density of uncurved space) by less than a factor of 100. This requires a fantastic fine-tuning of the mass density at very early times. e.g. at 10^{-35} s the relative deviation from the critical mass density must have been smaller than 10^{-49}. A slightly higher density would have led to recollapse after a very short time. A slightly lower density would have made the formation of galaxies still much more improbable than it already is in the standard model.

The inflation model postulates that the universe expanded its diameter exponentially in time during the first 10^{-35} s from one μm to 0.1 m involving velocities much higher than the speed of light. A 'cosmological constant' Λ is invoked which had to take on a very large value giving rise to a repulsive gravitational force. After just the right infinitesimal time span Λ had to drop to zero. The concept of the cosmological constant, which lacks any experimental basis, goes back to Einstein, who considered it as "the biggest blunder of his life." The inflation model is based on a family of very speculative theories in elementary particle physics, called 'Grand Unified Theories' (GUTs). GUTs are an attempt to unify the electro-weak and the strong interactions. Involving over twenty free parameters, GUTs are rather unspecific; nevertheless they make three predictions: a) The proton must decay with a half-life of 10^{30}-10^{33} years, b) There must be magnetic monopoles 10^{16} times as massive as the proton. c) Neutrinos must have nonvanishing rest mass.

In spite of great efforts, none of these predictions could be verified experimentally up to now. There is in fact little reason for believing in GUTs. Should GUTs be correct, there may still be no inflation; but if GUTs are wrong, there is no basis for inflation.

Inflation can at best make the standard model somewhat more plausible; but it can never explain the origin of the universe. For that purpose a still higher and more powerful theory is called for, which usually goes by the name 'quantum gravity.' This nonexistent theory is left with the task of explaining the many ad hoc parameters and processes postulated by GUTs. The mere existence of the inflationary scenario is a strong indication of the difficulties of unstructured-origin cosmologies.

Concepts of Structured Origin

There exists a variety of proposed models differing in amount and detail of structure assumed as the initial conditions. C. W. Misner[21] advertised an expanding universe that oscillates irregularly between cigar-like and pancake like shapes. It is called 'mixmaster model.' V. A. Ambartsumian[22] envisaged the formation of a galaxy as an individual elementary process, which is

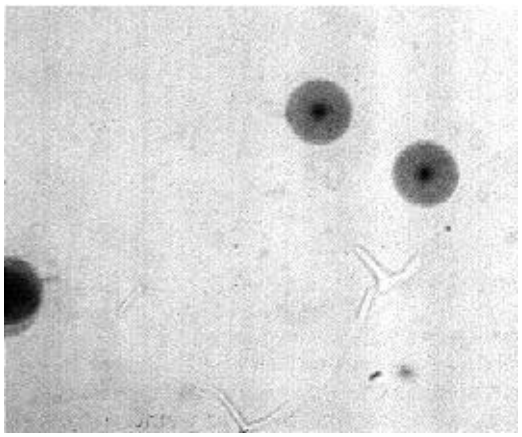

Figure 1. ^{210}Po radiohalos in mica. They were produced by α–particles from the decay of ^{210}Po in the center (E_α = 5.31MeV, T=138d).
Scale 235:l. Photomicrograph by R. V. Gentry, Oak Ridge National Laboratory.

beyond the reach of present-day physics. H. Alfvén[23] announces a paradigm shift in cosmology. He stresses the importance of plasma physics for cosmology and he promotes an inhomogeneous 'fireworks model' of metagalactic evolution involving large-scale electric currents, electric double layers, filaments, and a cellular structure of the cosmos.

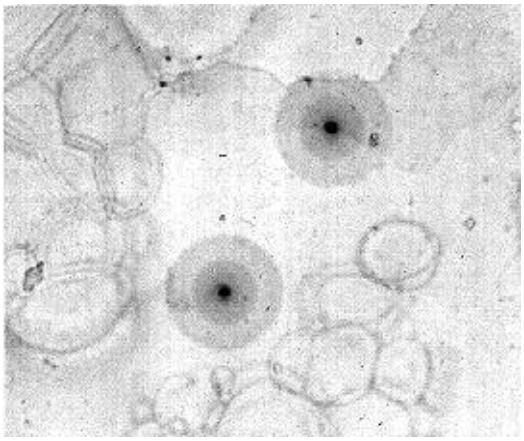

Figure 2. ^{214}Po radiohalos in mica. Outer ring from a-decay of ^{214}Po (E_a = 7.69MeV, T = 164μs), inner ring from *a*- decay of ^{210}Po (E_a = 5.31MeV, T = 138d).
Scale 235:l. Photomicrograph by R. V. Gentry, Oak Ridge National Laboratory.

Polonium Radiohalos

A maximum of initial structure is assumed in a concept suggested by R. V. Gentry[24] on the basis of his investigations of polonium radiohalos in Precambrian granitic basement rocks from several continents. Radiohalos (pleochroic halos) are spherical discolorations of 10-100 μm diameter in transparent minerals (e.g. mica). They were produced by alpha particles emitted from a central grain—about one μm in size-consisting of radioactive material (^{238}U, ^{232}Th, ^{218}Po, . .). If the radioactive substance in the center runs through a chain of decay as e.g. ^{218}Po:

^{218}Po $\xrightarrow{\alpha\,\beta\,\beta}$	^{214}Po $\xrightarrow{\alpha\,\beta\,\beta}$	^{210}Po $\xrightarrow{\alpha}$	^{206}Pb	
3.05 min	164 μs	138 days	∞	half-lives
middle ring	outer ring	inner ring	(stable)	
3 rings	2 rings	1 ring		

there will be a concentric sphere (a ring in the microscopic view) of characteristic radius for each alpha-decay. Gentry found that in primary rocks there exist three types of polonium halos:

a) Three-ringed halos which originally contained ^{218}Po
b) Two-ringed halos that started from ^{214}Po
c) One-ringed halos caused by ^{210}Po.

Though these polonium isotopes are members of the decay chain of ^{238}U, the rings of the earlier five alpha-decays of the chain are missing and the centers do not contain any ^{238}U but only ^{206}Pb. Radiohalos are erased if they are exposed to temperatures above 300°C, which is far below the melting point of the minerals. In view of the extremely short half-lives especially of ^{218}Po and ^{214}Po there has been no convincing explanation how any polonium atoms stemming from the uranium decay chain could have been isotope-separated and moved to the halo centers before they decayed—at temperatures where the mineral is solid. Hypothetical long-lived isomer precursors of the polonium have been excluded by Gentry's measurements. Gentry concluded:[25]

> Polonium halos, of which there are estimated to be more than 10^{15} in the Earth's basement granitic rocks, represent evidence of extinct natural radioactivity, and thus imply only a brief period between 'nucleosynthesis' and crystallisation of the host rocks.

Such a concept does not appear to be compatible with common ideas about the origin of chemical elements and planetary systems.

Conclusions

G. Burbidge remarks:[26]

> Probably the strongest argument against a big bang is that when we come to the universe in total and the large number of complex condensed objects in it, the theory is able to explain so little.

R. Kippenhahn makes a significant point:[27]

> Cosmologists do not like a solution in which the universe did not explode from a point-like state of infinite density but instead suddenly was there with finite density and obeyed the laws of physics. The reason for this bias may be simply that then by the same token as it came into being the whole world might abruptly be off again.

Such an argumentation reveals magical rather than scientific thinking. In the coming years there will be an enormous wealth of observational data gathered by space telescopes in the full range of the electromagnetic spectrum, by underground and undersea neutrino telescopes, by collectors of interstellar gas, and by

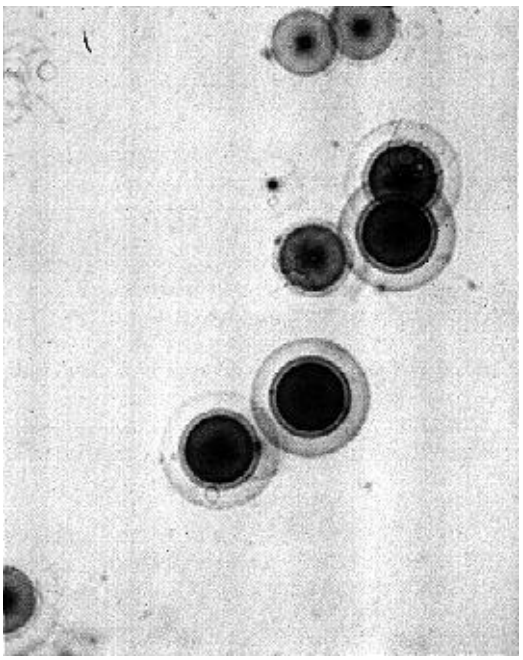

Figure 3. ^{218}Po radiohalos in mica. Middle ring from ^{218}Po (E_a = 6.00MeV, T = 3.00min), outer ring from ^{214}Po (E_a = 7.69MeV, T = 164μs) inner ring from ^{210}Po (E_a = 5.31MeV, T = 138d).
Scale 235:l. Photomicrograph by R. V. Gentry, Oak Ridge National Laboratory.

other techniques. Alfvén cautions:[28] "We should wait for further results from space research before we set up a new paradigm." Narlikar writes:[29]

> Astrophysicists of today who hold the view that 'the ultimate cosmological problem' has been more or less solved may well be in for a few surprises before this century runs out.

The concept of self-organization (evolution) encounters similar problems in different fields of study—on the macroscopic and microscopic levels. What we obviously need is *complexity, structure, information, and organization right from the beginning*—for the universe as a whole as well as for a living system.

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PROOF

PHILLIP D. O'HERN*

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Apparently false science,*
  Lately grown quite humorsome,
Has proved my evolution
  By a Panda's extra thumb.
*I Timothy 6:20

After his first collection of essays, *Ever Since Darwin*, Stephen Jay Gould has published another series of reflections in natural history entitled *The Panda's Thumb* (W. W. Norton, 1980). The purpose of the book is to prove evolution.

Gould states that textbooks usually illustrate evolution with examples of perfect design. But he admits that optimal design is better evidence for omnipotent creation than for ungodly evolution. He argues that oddities are the proof of evolution, because divine creation would not choose that method.

"The proof of evolution," Gould avers, "lies in imperfections." His first essay illustrates the point by using the example of a giant panda's thumb. The panda strips leaves from bamboo by passing the stalks between his fingers and what resembles an opposable thumb. But only humans are supposed to have opposable thumbs! The explanation for this exception is that the panda has five digits, a true thumb, and a flexible, muscled, radial sesamoid. An abductor muscle pulls the radial sesamoid away from the true digits, and this serves as a somewhat opposable thumb. Gould contends that possibly a single mutation caused the evolution.

And so the traditional evolutionist uses examples of perfection to prove evolution. And Gould uses examples of imperfection to prove evolution. In that . . . I find humor. Who says you can not have your cake and eat it too!

*Phillip D. O'Hern, a religious poet, receives his mail at P.O. Box 650, Mobile, AL 36601.

QUOTE

. . . We do not solve social problems but rather create social monsters when man is treated first as an accident and then the particular man is denied his participation in his own being on the grounds that he is only an unfortunate accident of nature. It takes no doctor of logic to concludc that if man is such a random being, it can be only a random force that man himself uses upon his fellows, even if the user is dignified by degree as a socioligist or psychiatrist. If the determinist's premise is correct, then social or psychic manipulations may establish only a random order. Thus determinism entangles mind hopelessly in contradiction.

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