Answers Research Journal 2 (2009): 1–9.
www.answersingenesis.org/arj/v2/intolerance-modern-cosmology.pdf

ARJ

A Brief History of Intolerance in Modern Cosmology

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Abstract

A review of some recent well-documented cases of intolerance in the cosmology field illustrates a common problem in science. Many relate to the Big Bang theory, such as the case of Geoffrey and Margaret Burbidge and Halton Arp. None of the accounts involved Intelligent Design advocates or creationists. This selection removes this compounding factor from the evaluation, but the cases have direct relevance to both Intelligent Design and creationism because both groups face the same resistance. It was concluded that it is critical for science to advance that, new ideas must be evaluated on the evidence and not because they challenge established science. This problem has persisted during the entire history of science, the most well known example being Galileo.

Keywords: Cosmology, Astronomy, The Big Bang theory, The origin of the universe, The history of science, Intolerance in science, Modern astronomers.

Introduction

The beliefs that humans have entertained about the universe for most of history are radically different from the views held by most scientists today (Wynn and Wiggins 1997). The epic discoveries of Newton on gravity, Galileo on the planets, Copernicus on the place of the earth in the solar system, Tycho Brahe on the planetary orbits, and others have revolutionized our view of cosmology. Even the knowledge discovered in the last century alone has drastically changed our worldview (Barrow and Tipler 1986; Barrow 1991; Bynum and Heilbron 1990, Davies 1989, 1991; Gribbon 1988, 1990; Maddox 1990; Trefil 1989). Computers, improved telescopes and new research techniques that allow us to view more of the universe in greater detail then ever before have revealed one surprise after another (Schroeder 1990).

Currently, the most widely accepted hypothesis of the universe's origin (and everything in it) is a theory called the *Big Bang*. This view hypothesizes that the Big Bang was an explosion of "space itself"—a concept difficult to understand partly because most people think of an explosion as the expansion of a material substance in space. Today, instead of "explosion" the preferred term is "expansion", although many people, including many scientists who are not astronomers, think of it as an explosion of matter only. Terminology aside, the Big Bang is the "creation myth that has dominated cosmology since the 1960s" (Panek 2005, p. 49).

In popular-science journals and scholarly papers alike, the Big Bang is almost universally spoken of as established fact, even though much controversy still exists about the theory among scientists and others (Lerner 1991; Martin 1999; Mitchell 2002; Piret 1991; Williams and Hartnett 2005). As Burbidge claims, although

> Big Bang cosmology is probably as widely believed as has been any theory of the universe in the history of western civilization, it rests on many untested, and in some cases, untestable, assumptions. Indeed, Big Bang cosmology has become a band-wagon of thought that reflects faith as much as objective truth (Burbidge 1992, p. 120).

And, unfortunately, the problems with this cosmology (and support for alternative cosmologies) rarely are given mass media coverage—although a few articles do get through (Beichman 1992; Harrison 1991; Lemonick 1991a; McDonald, 1991; Piret 1991).

Extensive coverage of cosmology has appeared in the *New York Times*, *The London Economist,* and *The Wall Street Journal,* all based on interviews with *only* astronomers that support the orthodox model (Burbidge 1992, p. 120). Burbidge concludes that this intolerance (the word that he uses) exists not only among the senior cosmologists but, to a greater degree among their younger colleagues, partially because most astronomical textbooks "no longer treat cosmology as an open subject. Instead, the authors take the attitude that the correct theory has been found". Some scientists have concluded that this attitude which dominates the scientific orthodoxy today has actually impeded the search for potentially more valid answers about origins (Lerner 1991). Problems with both the existing model and alternative theories do exist, such as the ekpyrotic model that some scientists are "calling the first credible alternative to the reigning big bang model and its long-standing add-on, inflation" (Seife 2001, p. 189). My focus here is on the right to freely question scientific orthodoxy

without censorship, loss of professional standing or even loss of one's career.

Scientists who make empirical observations or reach conclusions in this field that are contrary to those that support the contemporary orthodox cosmology may well find themselves ostracized from mainline science (Maddox 2001). Also, unfortunately, taking an unorthodox position can end one's career: "Geoffrey and Margaret Burbidge were once among the most celebrated astronomers in the world. They now live in relative obscurity" because of their heresy (Panek 2005, p. 49). Edinburgh Royal Observatory astronomer Michael Hawkins notes that it requires

> almost suicidal courage to leave the herd and challenge the authority of the astrophysical establishment. Typically, papers expressing genuinely new ideas are refused publication by referees of reputable scientific journals on the ground that they undermine the generally accepted principles of physics. Those who persist in writing such papers are usually sidelined from the astronomical community by their peers (Hawkins 1997, p. 29).

Burbidge claims that the censorship is so severe that researchers who "find evidence contrary to standard cosmology" are denied telescope time, their papers are "denied publication for years or are blocked by referees", and they are even denied academic positions (Burbidge 1992, p. 120). The situation, Burbidge stresses, "is particularly worrisome because there are good reasons to think the Big Bang model is seriously flawed". The attitude in many quarters is to avoid even thinking about the evidence against the Big Bang model. John Maddox, the long-time editor of *Nature* who concluded that skepticism about the Big Bang is "well-founded", once asked a colleague if he had read a new book critical of the Big Bang published by Cambridge University press. Maddox reported that the colleague responded that he "Wouldn't waste the time" (Maddox 2001, p. 270). The work by Burbidge, Hoyle, and Narlikar is taken seriously by some scientists, though. In a review of their latest book, Hogg and Zaldarriaga noted that for decades

> Fred Hoyle, Geoffrey Burbidge, and Jayant Narlikar have done the cosmology community a great service by developing and defending a serious alternative to Big Bang models of cosmic origins. *A Different Approach to Cosmology* is a summary of their work, most of which has appeared in the refereed literature, accompanied by useful commentary (Hogg and Zaldarriaga 2000, p. 2079).

Another case is Dr. Stefan Marinov, Assistant Professor of Physics at Sofia University for over a decade and Editor of *Deutsche Physik*. He experienced repeated rejection of his papers critical of certain modern cosmological and other views, some of which had implications for the age of the earth. Some of his ideas were very unorthodox, but a number of scientists were convinced that they were plausible. As reported in the leading British science publication *Nature*, Dr. Marinov, described as a Christian, submitted papers and proposals on his conclusions.

Dr. Marinov committed suicide on July 15, 1997, by jumping out of the top floor of the Bibliothek of the University of Graz in Austria. The reason he gave was that he was devastated by the level of intolerance in the scientific establishment. A letter by Erwin Schneeberger noted that Stefan left some letters in his apartment that revealed his concerns and, although he left names and telephone numbers for the police,

> they did not inform anyone, even his son Marin Marinov who is vice-Minister of Industry in Bulgaria. So I and most of his other friends were informed nearly two weeks later by a journalist of a local newspaper. … For all his friends, Marinov's decision is absolutely unbelievable. He was a powerful, enthusiastic physicist with a bright smile on his face until the last time I had seen him on July 13. On this occasion he gave me his editions of *Deutsche Physik*, numbers 3 through 22, about 50 pieces each (Schneeberger, personal communication).

The Illusion of Certainty

True believers in modern cosmology often try to convince the public that their worldview is proven fact, and that no competition exists. The degree of faith that many scientists have placed in their theory is illustrated by University of Chicago physicist David N. Schramm, who argued that persons whose conclusions are contrary to the Big Bang are put in the same league by orthodox scientists as members of the flat earth society: "Just as you've got people out there who argue very seriously that the earth isn't round, you've got these people saying that there never was a Big Bang" (Lipkin 1990, p. 56).

Halton Arp, for many years a practicing astronomer at Caltech and the Mt. Palomar Observatory, was once "a stellar light in astronomical circles", but is now an astronomer-in-exile living in Germany. Arp's career "was eclipsed because of his unconventional views that defied conventional wisdom" (Jueneman 1990a, p. 45; also see Arp et al. 1990; Arp 1999; DeMeo 1990). Arp and his supporters claim that, just as Jewish scientists were forced out of Nazi Germany for their "Jewish science", Arp was forced out of American astronomy because his fifteen-year field research on quasars forced him to conclude that they were phenomena within our own galactic neighborhood "and not distant anomalies at the outer limits of cosmic space" as is taught by orthodox scientists (Jueneman 1990a, p. 45). He now works doing research in Europe where they are more accepting of his heresy.

Big Bang Dissenters, Quasars, and the Red Shift

Arp argues that the red-shift method, which attempts to ascertain both a galaxy's distance and the velocity of its recession from earth, breaks down in the case of quasars. Quasars are extremely luminous objects that evidently outshine the brightest galaxies. Hypothesized to be titanic whirlpools with swirling masses spiraling into vast black holes, their massive size produces gases that congeal into disks that spin at speeds approaching that of light as they move towards the black hole proper.

The large red shift that quasars display argues that they are traveling at a considerable fraction—some estimate from 80 to 90 percent—of the velocity of light (Jueneman 1990a, p. 45). Quasars flying outward at velocities close to the speed of light imply that they were once located an extremely large distance away from where they are currently located (Halliwell 1989). The evidence Arp discovered does not support this conclusion but, instead, supports the idea that quasars are the companions of nearby small red-shift galaxies.

The extraordinary red shifts of the quasars was a major factor that caused Arp to question the Hubble constant. According to red-shift data, one quasar was inferred to be splitting, and each half was receding from the other at ten times the speed of light—an impossibility (Jueneman 1990b, p. 53). From evidence along this line, both Arp and his colleague, John W. Campbell, rejected the standard red-shift data conclusions and argued instead that quasars must be our galactic neighbors. Campbell concluded that the major red shift observed is caused by the galaxy's gravitational pull on the light trying to escape the quasar, which causes the light to convert much of its energy into heat.

Arp's research contradicted the orthodox conclusion that quasars are among the oldest and most distant structures in the universe. His research indicates that quasars are much younger than is commonly believed and that quasars must be intrinsically different from the model proposed by current Big Bang theory. Specifically, he believes that their nuclei could be centers of creation events that regularly eject new matter into the universe. Arp's conclusion that quasars are not on the edge of the universe as commonly believed, but must be associated with nearby galaxies, calls into question the standard interpretation of using red shifts to determine distances (Heppenheimer 1990, p. 22).

He did not reject the Hubble conclusions outright but believed that it did not apply to the cases that he presented. In short, Arp challenged the accuracy of the red-shift measuring stick by concluding that quasars must be within our galactic neighborhood, even though they manifest a huge red shift. This research also raises doubts about the calculations on which the expanding universe, theorized to have been caused by the original Big Bang, is based. This controversy is of great importance partially because the red-shift question involves basic issues "concerning the origin, event, and dynamics of the entire physical universe. The conflict involves strong personalities, intriguing data, and no clear solution" (DeYoung 1983, p. 41).

Because Arp's conclusion "ran counter to accepted dogma and profaned a holy name—the sacrosanct Hubble red shift—Arp was petitioned to discontinue this line of study and recant his heretical views. When Arp refused on grounds of conscience, he was branded a recidivist and exiled beyond the cloistered pale of academia" (Jueneman 1990a, p. 45). That this criticism is voiced in mainline scientific journals such as *Science* and *Nature* indicates the level of concern over the repercussions that result from criticizing certain aspects of the Big Bang idea.

Arp was allegedly first given a chance to change his area of investigation and was openly told that he would be denied all telescope time if he refused. He chafed at this inquisitional tactic and, consequently, soon "found himself unwelcome not only at Palomar but at the world's other major observatories as well" (Heppenheimer 1990, p. 94). In Heppenheimer's words for

> Arp the question of whether he is right or wrong has become secondary; the real question is whether ideas that run contrary to established scientific beliefs should be ignored or entertained. "Everyone is convinced that their view is the way things are," he says. "The test is whether they will permit discussion of contrary evidence. If they say, 'no we won't permit it,' then I think you have to be suspicious that they don't have the right answers" … Arp … finds it curious that in science, supposedly an open forum for the discussion of ideas, majority opinion often decides the outcome. "People have a psychological need for certainty in their lives. If the ideas people rely upon are shown to be incorrect, then they feel adrift and insecure" (Heppenheimer 1990, p. 94).

Heppenheimer concludes that either Arp's ideas will overturn the Big Bang,

> or they may flounder in the light of ongoing research. But, he hopes that the ordeal he lives through each day will produce a new generation of astronomers who would be less rigid and more open minded in their approach. "It always takes more time than you think," he says philosophically. "And the stakes are getting higher and higher. I would prefer not to be a heretic—but it's more important to get the right answer than to feel good" (Heppenheimer 1990, p. 94).

In response to this article, DeMeo stated that

Halton Arp's case "should elicit outrage from anyone who calls himself a scientist" (DeMeo 1990, p. 14). DeMeo adds that whether or not Arp is wrong is largely irrelevant; the concern is that he "could be denied access to the necessary research instruments and banished overseas shows how far down the road toward intellectual fascism our academic research institutions have gone". In spite of the censorship problem, criticism of the Big Bang hypothesis has spread to respectable mainline science publications. Writing in *Nature,* Maddox (1989, p. 425) stated that, "Apart from being philosophically unacceptable, the Big Bang is an over-simplified view of how the universe began, and it is unlikely to survive the decade ahead".

Lerner (1991, p. 3) even concluded that we are now involved in a scientific revolution that is likely to overthrow many of the dominant ideas of contemporary science—and the dogma that he has concentrated on overthrowing is Big Bang cosmology. The reason for the overthrow, he concludes, is because, "In the past few years, observation after observation has contradicted the predictions of this theory". Lerner advocates a theory called *plasma cosmology* and concludes that the universe is without beginning or end, but acknowledges that this idea also has many major shortcomings (most scientists believe "lethal" shortcomings is more accurate).

A more recent example is João Magueijo, professor of theoretical physics at Imperial College, London and a Royal Society Research fellow. His doctorate is in theoretical physics from Cambridge. Magueijo's first-person account of his life reviews in detail the intolerance and travails that result from deviating from orthodoxy and researching unconventional theories (Magueijo 2003). Examples include collaborators that, due to fear of repercussions, backed out of coauthor status just before a major paper with Magueijo is published, journal editors make rude and inappropriate comments, and rejection slips pile up (as do threats, such as associates warning him about risking harm to his career by contradicting the science establishment). All of this is painfully well documented in his book.

Nonetheless, more than a handful of scientists have major scientific objections to the validity of Big Bang theory. One conference of about 30 scientists published an open letter in *New Scientist* which "protested the stranglehold of Big Bang theory on cosmological research and funding" (Ratcliffe 2005, p. 19). So far, "about 300 signatories representing scientists and researchers of disparate backgrounds" have signed the open letter (Ratcliffe 2005, p. 19).

Philosophical Implications of Big Bang Theory

The implications of the Big Bang view have been discussed extensively by philosophers and scientists alike. Browne (1980, p. 45) claims it is a "gloomy view" of the universe. This position is best articulated by Nobel laureate particle theorist Stephen Weinberg, a former Harvard University professor. In his best seller, *The First Three Minutes,* Weinberg discussed the events hypothesized to have occurred in the first three minutes after the Big Bang. Weinberg wrote that the "more the universe seems comprehensible, the more it also seems pointless. … The effort to understand the universe is one of the very few things that lifts human life a little above the level of farce, and gives it some of the grace of tragedy" (Weinberg 1977, pp. 154–155).

The Cosmic Egg

The Big Bang theory hypothesizes that the universe started with the "explosion" of a *cosmic egg*, also called the *plasma ball* (Silk 1990). This plasma ball consisted of all of the energy in the universe, much of which produced all of the particles needed to construct all matter, including all quarks, photons, and leptons, such as electrons, in the universe. Even space itself is contained in the initial singularity in contrast to the widely believed myth that the Big Bang is a conventional explosion into pre-existing space time. The widely accepted theory is that "all matter [was] created at the initial instant" of the explosion, presumably from nothing (Hogg and Zaldarriaga 2000, p. 2079).

This cosmic egg now is estimated by most cosmologists to have expanded from ten to over fifteen billion years ago (the date for universe's origin has doubled about every 25 years since about the 1650s, and the latest estimate will no doubt also change). The estimated size of the original primordial egg that existed at the time the Big Bang occurred also has changed drastically (Singh 2005). It once was hypothesized to be as much as one light day across, about as large as our solar system (Faber 1990, p. 88). Later, some researchers hypothesized that all of the universe's matter was concentrated into a mass with a diameter about seven times that of the earth and a density of 200×10^{18} tons per cubic inch. It was even once estimated to be as small as Planck's length, 10^{-33} cm, or several billionths of the diameter of a proton.

The most common view today is the cosmic egg is a mathematical point that has an undefined physical size and lacks an interior structure (Fox 2002). Faber (1990, p. 88) even regards it as not "real" but "as a question mark". The cosmic egg hypothesis is a result of extrapolating backward in time from contemporary evaluations of the universe's background radiation.

A major unanswered question is the origin of the primordial egg itself, specifically where it came from

and what internal or external factors could have caused it to explode or expand (Davis 1990; Ellis 1991; Gribbon 1993). The view that all matter, energy, and time were contained in the primordial egg, or were created when it exploded, assumes an event in history that does not explain the *origin* of that universe or *why* the primordial egg could (or did) exist. Teaching that the origin of a plant was from a seed only reveals a greater mystery for the reason that creating a seed able to produce a plant is an even greater feat than producing the adult plant itself. Thus, Maddox concludes that the Big Bang

> origin of the Universe is thoroughly unsatisfactory. For one thing, the implication is that there was an instant at which time literally began and, so by extension an instant before which there was no time. That in turn implies that even if the origin of the universe may be successfully supposed to lie in the Big Bang, the origin of the Big Bang itself is not susceptible to discussion. It is an effect whose cause cannot be identified or even discussed (Maddox 1989, p. 425).

To some degree the cosmic egg hypothesis only pushes the uncaused first cause farther back in history, and may raise more questions than it answers (Craig and Smith 1995). Faber hypothesizes what existed before the Big Bang is presently speculation because it requires a hypothetical theory of quantum gravity that can explain what occurs inside the Planck length, information we do not have, but it is known that strange

> things happen in tiny spaces on short time scales, even in vacuums. Virtual particles [each consisting of a particle and its paired anti-particle] appear and disappear continuously in sort of quantum fluctuations. It's a violently active medium and we think the ylem [Greek for primordial stuff] was also … these same sorts of quantum fluctuations, things appear and disappear in this foam. I think the region that made the universe was like a virtual particle that happened to survive. It appeared, and by great luck, its properties and physical laws allowed it to evolve away from a tiny instability into the universe we call our own (Faber 1990, p. 88).

The primordial fireball, referred to as *ylem*, is the theoretical radiation-dominated phase of the universe. Such speculations as this indicate the extremely tenuous nature of much modern hypothesizing about early cosmology.

Although this cosmic egg is speculation based on current scientific empirical research, it has been a fruitful area for creative imagination, as evinced by theorists ranging from Weinberg's *The First Three Minutes* (1977) to Gribbin's *In the Beginning* (1993). The cosmic egg problem was penned by Hoyle as a "persistent weakness in the theory" that is "becoming ever harder to overlook" and can be understood by picturing what happens when a bomb explodes. Fragments are thrown into the air, moving in essentially uniform motion. Uniform motion is inert, incapable of doing anything constructive. It is only when the bomb fragments strike a target—a building, for example—that anything happens. Bombs exploding indoors and those exploding in a remote place in the open produce very different results. Hoyle adds, in the Big Bang no targets exist because the entire universe takes part

> in the explosion. There is nothing for the expanding universe to hit against, and after sufficient expansion, the whole affair should go dead. However, we actually have a universe of continuing activity instead of one that is uniform and inert. Instead of matter becoming colder and more spread out, we often see it clustering together to produce the brilliant light of swirling galaxies and exploding stars. Why should this be so against expectations that appear soundly based in all other aspects of physical experience? Where is the drive for sustained activity coming from? (Hoyle 1984, p. 84)

Criticism such as this has motivated the modification of the theory, modification that still continues. Another concern is that, according to general relativity theory, the original explosion supposedly came from a *singularity*, a mathematical point where the existing laws of nature no longer apply. Negating known laws of physics solves many problems, but is actually a metaphysical solution—literally one that is "beyond physics". For example, the primordial egg is hypothesized to have had an "infinite" temperature and density, or at least a temperature level and density far beyond that now known to be possible—a level beyond physics.

Burbidge (1992, p. 120) notes that we still lack a reasonable theory as to how galaxies and larger structures could have formed out of, or by, an expanding universe. This situation renders doubtful, or at least argues against, the formation of galaxies by the gravitational collapse process. Ideas proposed to solve this problem include cosmic strings or fluctuations (the theory that the universe consists of thin, smaller-than-atomic-sized string-shaped particles) that occurred at a very early stage of Big Bang evolution (Davies and Brown 1988; Green, Schwarz, and Witten 1988). Both of these theories cannot be directly empirically tested at the present time—thus is beyond physics.

The Big Crunch

Some cosmologists also speculate that the original cosmic explosion will eventually slow down and produce what is called the *Big Crunch* (also called the *closed universe theory*). This theory assumes that the

level of matter in the universe (and thus the amount of gravity) is great enough to allow the universe to expand only so far, and then it will start to collapse on itself (Saslaw, 1991; Saunders et al., 1991; Silk, 1989). These scientists estimated that the cosmos will begin contracting about fifty billion years from now.

The Big Crunch is largely a reverse of the Big Bang: at the end of the universe all galaxies, stars, atoms, etc., will eventually collapse; then the enormous pressure will break down all matter back into its original constituents. Stars and planets will fuse into hot plasma, producing another primordial egg and the universe will die. Most astronomers, however, currently believe the opposite view—viz, that the evidence derived from research in the 1990s that the universe's expansion is accelerating indicates that the universe will expand forever. As the heat is dissipated across greater and greater areas, the universe will grow increasingly cold. As a result, it will eventually die by freezing (a view called the *open universe*).

Why is Criticism of the Big Bang Suppressed?

Big Bang cosmology is typically presented as established fact; instead of the data and observations that do not fit serving to motivate scientists to more carefully evaluate the Big Bang, the observations are sometimes arbitrarily dismissed because true believers conclude they *must* be wrong. This situation illustrates the Kuhnian hypothesis: although the opinion of some astronomers is that as evidence against the Big Bang accumulates, this evidence is often explained away or dismissed, sometimes by ostracizing the astronomers who are uncovering the evidence. Unfortunately, though, the tenacity with which this worldview is held prevents an objective evaluation of the evidence, both that in favor, and that against this belief (Spetner 1997). Hoyle explained that, as a result of the concerns reviewed above, the major "efforts of investigators have been in papering over holes in the big-bang theory, to build up an idea that has become ever more complex and cumbersome" (Hoyle 1984, p. 84). He compares this to the idea of epicycles developed by Ptolemy in the second century A. D. To account for the fact that the planets moved in complicated paths across the sky with respect to the nearly fixed background of stars, Ptolemy suggested that planets "revolved around the earth in a sequence of embedded circles, epicycles, circles on top of circles". This complex system eventually failed in spite of the fact that Ptolemy's model was remarkably successful at predicting the position of planets and was used for centuries. Unfortunately, "it may well be that proponents of the big-bang are making a similar misjudgment" (Hoyle 1984, p. 84).The fact is, a model that is fundamentally wrong can make successful predictions, as was true of Ptolemy's model, may prove to be true of the Big Bang model as well.

In answer to the question, "Why has the Big Bang cosmology become so deeply entrenched in modern thought," Narlikar concludes the theory has become orthodoxy as a result of the "intellectual pall created by the hypothesis-enshrined-as-fact" problem (Narlikar 1991 p. 48). Burbidge, in answering the same question, stated that

> there are two immutables: the active creation and the laws of physics, which spring forth fully fashioned from that act. The Big Bang ultimately reflects some cosmologists' search for creation and for a beginning. That search probably lies in the realm of metaphysics, not science (Burbidge 1992, p. 120).

This observation is true in spite of Hoyle's conclusion that a "sickly pall now hangs over the big-bang theory. When a pattern of facts becomes set against a theory, experience shows that the theory rarely recovers" (Hoyle 1984, p. 84). Jayant Narlikar added that "Astrophysicists of today who hold that the ultimate cosmological problem has been more or less solved may well be in for a few surprises" in the future (Hoyle 1984, p. 84). The last few decades have had more then a few surprises in cosmology. A major concern with modern dogmatic Big Bang cosmology is that it is

> not a sound strategy to put all of our cosmic eggs into one big-bang basket. Rather, we should explore the possibilities. Three years ago, there was a more open debate on alternative theories, which made valuable contributions to our understanding of cosmology. For a healthy growth of the subject, the Big Bang hypothesis needs competition from other ideas (Narlikar 1991, p. 48).

A History of Big Bang Cosmology

The term "Big Bang" was first coined by Fred Hoyle in the 1940s, in an attempt to disparage the theory. In the 1940s there existed almost no evidence in support of Big Bang cosmology—the supposed evidence came much later. By the end of the 1960s, "virtually all astrophysicists were convinced that the cosmos was born in a single massive explosion, and doubters were left out on the fringe" (Lemonick 1991b, p. 62). Major evidence used today to support the Big Bang include data that support the universe's expansion, such as the red shift of light, but also the dominance of light elements (primarily hydrogen and helium) in the universe, the discovery of the 3K background radiation, and the conclusion that expansion of sufficient magnitude is necessary in order to prevent gravitational collapse of the universe (Ellis 1991; Hogan 1989, 1991; Peterson 1990a, 1990b, 1991). This (and other) evidence caused physicists to abandon the previously dominant cosmological theory, the steady state view.

The idea that the universe sprang from a cosmic egg of infinitesimal size that is, the Big Bang, was originally proposed by astronomer-priest Abbe Georges Lemaitre in 1931. Lemaitre, a Belgian scholar, evidently had the biblical account in Genesis in mind when he developed his view. His theory went largely unnoticed until his work was taken up by Sir Arthur Eddington and George Gamow. Maddox notes that the "doctrine of the Big Bang" has a strong appeal for some creationists "seeking support for their opinions" (Maddox 1989, p. 425).

Lerner (1991) even concludes one reason the Big Bang was accepted was due to the influence of Christian doctrine of creationism on science. A common explanation used to harmonize the Big Bang with theology is the claim that Genesis gives

> credence to this theory. This theory holds that our universe is constantly expanding, having begun from a central explosion of energy which subsequently hurled gases and particulate-forming atoms outward from this central point. From this came into being our universe. How simply it [the Big Bang theory] is summarized in the statement that "In the beginning God created the heaven and earth." (Genesis 1:1). *New Albany Bible Students Ecclesia Newsletter* (Sept. 1984, p. 1).

The motivations of one scientist who verified the background radiation, Arno A. Penzias, were also partly religious. He describes himself as a creationist who is "deeply religious," and believes that the characteristics of the universe are "precisely what organized religion predicts". He told the *New York Times*: "The best data we have are exactly what I would have predicted, had I nothing to go on but the five books of Moses, the Psalms, [and] the Bible as a whole" (Browne 1978, p. 54). Penzias also acknowledged that "very few winners of Nobel prizes in science, and for that matter, very few scientists generally, have been strong religious believers" (Browne 1979, p. 282).

A major problem with one of the Big Bang's rivals, the steady state theory, is that it teaches creation had no beginning and will have no end, and exists as a separate entity apart from a creator. The steady state view existed from about 1915 to about the early 1960s when the Big Bang hypothesis became increasingly prominent. Since the steady state theory was abandoned almost five decades ago, the Big Bang theory has been without a widely accepted rival.

The steady state theory also suffers from many problems, not the least of which is the requirement that hydrogen atoms continually form, evidently out of nothing, and from them new stars are being assembled as old ones burn out. Ironically, the big bang has the same problem—except it puts the formation of all mass from nothing all at one time, rather than continuous and gradual. Although no direct evidence now exists that could account for the spontaneous generation of hydrogen, a new *modified steady state theory* has been proposed by followers of late Fred Hoyle (Hoyle, Burbidge, and Narlikar 2000).

The problem that theists first must deal with is the question of the validity of the Big Bang. If it proves unsupportable, and contrary to the scientific evidence, there is no point in endeavoring to harmonize the theory with theology—a mistake many theologians are presently making. Unfortunately, a tendency exists for theologians to uncritically accept unproven scientific theory. It still may be premature—and erroneous according to some observers—to uncritically accept Big Bang cosmology as a whole, although many of its conclusions are probably valid, such as the suggestion that universe had a beginning and is in motion to achieve stability.

Summary

Big Bang cosmology (and cosmology in general as related to origins) is now swimming in a cauldron of conflicting ideas, theories, and personalities (Levy-Leblond 1990; Williams and Hartnett 2005). An enormous amount of information has been discovered about the universe in the last century, some of which supports the Big Bang, some of which does not (Waldrop 1991). Research developments designed to answer specific questions about cosmology inevitably have raised three or four new questions.

A few cosmologists even have concluded that the Big Bang hypothesis that has so far held sway for only a few score of years should be abandoned (Martin, 1999; Mitchell, 2002). If the Big Bang cosmological scenario is abandoned, the question of what will replace it is a major issue because a more viable nontheistic contender does not now exist. All of the competing theories suffer from as many, if not more, problems than the Big Bang. Although it is difficult to make confident predictions regarding the future of Big Bang cosmology, our concern here is the fact that much intolerance against qualified scientists forces us to question the objectivity of modern science. My focus in this paper was not the validity of the Big Bang, but the intolerance of scientists.

Scientists know a great deal about the universe, yet still are burdened with profound ignorance about many major cosmological questions such as the origin of the universe. Many of the theories discussed, such as the Big Bang, are based on much valid evidence but this does not mean that the theories themselves are proven beyond doubt. We must acknowledge that we are burdened with many huge gaps in our knowledge about the universe, and the conflict that believers and nonbelievers invariably face is not over the facts, but over the *interpretation* of the facts. To present the Big Bang theory as proven fact, as is often the case, is currently inappropriate.

The Big Bang theory also holds an enormous emotional sway over many people. Critics are silenced, often ruthlessly, and little is said in the media about these dissenters. In spite of its difficulties, even minor evidence that it is valid tends to be touted among scientists and the mass media as clear evidence, proving it beyond criticism. Supportive discoveries have received headlines or front page news coverage in both small and regional papers, while the non-supportive discoveries have largely been ignored by the media.

The concern is not that these ideas should not be discussed, but that they are discussed as if they are proven facts not to be questioned—and many authors argue far beyond the evidence for the Big Bang theory as fact. As an example, some authors assume the oscillating hypothesis—that history consists of a perpetual series of endless Big Bangs and Big Crunches—is fully proven (Saslaw 1991). Although one is less apt to encounter such dogmatic statements in carefully written scientific papers, the following is typical of the unwarranted confidence common in the media

> Big Bangs have been cyclic phenomena of immense proportion, explosively expanding to gravitational hesitation—and then contracting upon themselves to supercritical redetonation, repeatedly. There may be as many big bangs in the Universe as stars in the galaxy! But whatever it is—is part of the Universe. Matter-energy, the stuff of the Universe, is eternal (Shisler 1993, p. 68).

Labeling this what it is—speculation—will help us to evaluate more carefully what is true and will facilitate helping scientists reach the truth. Speculation passed off as fact impedes knowledge and does not help either science or religion.

The fact is, as University of California scientist Blas Cabrera stated, "science fills the same human needs as religion, and in many ways, replaces such—physics even has its priests—the advocates of the various theories that happen to be popular at the moment". Cabrera went on to stress, "There comes a point in one's work where you can no longer calculate everything … a point where imponderables affect your decisions … [and at this point] you must make a scientific leap of faith" (Cabrera 1982, p. 136).

Conclusions

Theories of the universe obviously have enormous implications in the problem of origins. Over 26 years ago, Sullivan, in an introduction to the *New York Times Survey of Science,* wrote that the year 1981

> saw a court battle between scientists supporting evolution and those seeking to have what they called 'creation science' … given equal time in Arkansas schools … Nevertheless, it became clear that scientists *were deeply divided on how evolution works and how the universe came into being* (emphasis added) (Sullivan 1982, p. 9).

Although much of this concern was relative to the biological evidence for evolution, much also relates to other topics, such as cosmology. Sullivan's statement is still very true today.

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