THE COSMOLOGICAL IMPLICATIONS OF MASS DISTRIBUTION

By Arnold G. Gulko

ABSTRACT

The distribution of mass and its motion in the cosmos are reviewed from the perspective of the Big Bang theory and this writer's Universe Cycle theory to determine the extent to which these theories are consistent with the observations. Particular consideration is given to the low density of the cosmos, the expected product of a primordial explosion, the homogeneous and isotropic distribution suggested by the Cosmological Principal, the clustering of galaxies and the bottom-up scenario for the formation of large cosmological structures. The expansion of the universe, its age, the theory of inflation and the existence and character of dark energy are also considered. Lastly, the large scale structure of the universe suggested by the tri-modal distribution of gamma-ray bursts is discussed.

Introduction

The origins of the cosmos should be revealed in the distribution of mass therein. Mass distribution raises problems in various directions, as will be discussed, and some of these interface with other problems. This writing will be restricted to matters reasonably related to the distribution of the objects we see in space, it being understood that it is sometimes necessary to consider matters relating to the existence of these objects and their motion.

The Two Competing Cosmological Theories

The Big Bang theory continues to dominate modern cosmology despite its many failures. That theory concludes the universe we see had its origin in a single primordial explosion which scattered particles outwardly in all directions. These particles were supposedly drawn together by gravity to form all the bright objects we see in space. If this is correct the distribution of mass in the cosmos and the motion of that mass therein should follow out of the existence of a single primordial explosion and the actions of gravity.

This writer has consistently concluded from the basic physics which he developed that what we see is not the result of a single primordial explosion, but is instead the result of the separate explosion of black holes formed in prior universes. On an immense scale these black holes are thought to be uniformly distributed in an endless space, but on the scale of the visible universe these black holes are non-uniformly distributed, having been concentrated by gravity while forming part of those prior universes. If this alternative scenario, termed the Cycle of the Universe (because the galaxies we now see will ultimately be consumed by the black holes growing at their centers to set the stage for another universe), is correct, then the distribution of mass in the cosmos and their motion therein should follow out of a plurality of primordial explosions, one for each black hole, to form separate galaxies.

The Creation of Space and Time

Mass is distributed in space so the existence of space is part of the problem. Also, as we observe mass in space we look back in time since the light from a remote object takes time to get here. The character of objects in space differs at different distances from us, so the passage of time is another part of the problem.

The Big Bang theory suggests a single primordial explosion created both space and time, but there is no explanation of how this might have been accomplished. So the Big Bang theory explanation of the existence of time and space is an illustration of the poorly supported speculations which pervade modern astrophysics. This subject will not be fully considered herein, but two points are briefly noted. First, relativity equations are interpreted to reach this conclusion because they provide an imaginary answer when one assumes negative time. However, negative time is an imaginary parameter, so an imaginary answer necessarily follows out of the selection of an imaginary parameter instead of out of physical necessity. Second, the gamma-ray bursts, which this writer concludes are primordial explosions, are taking place at a time and in a space which existed when each explosion took place - so those bursts do not create either space or time. It appears that space and time have always existed and we have no concept of how this is so.

The Density of the Cosmos

A major problem is the low density of the cosmos. While the galaxies are very massive they are very far apart, so the large scale density of luminous matter is quite low. How could a single primordial explosion produce enormous concentrations of mass which are so far apart when gravity is so weak it could not have sufficiently concentrated the particles produced by that explosion or evacuated the space between the galaxies in the limited time (less than 14 billion years) available in the Big Bang theory? Indeed, we see fully formed widely separated galaxies in remote space, so the light from those galaxies took many billion years to reach us. Accordingly, in a big bang universe gravity had to form those galaxies and evacuate the space between them in far less than 14 billion years - in some instances in less than 2 billion years. This does not appear to be possible, so astrophysics now speculates (with hardly any real suppor)t that the concentrations of mass we see were initiated in the primordial explosion.

The Mass Distribution of a Primordial Explosion

While we don't know the precise nature of the Big Bang's primordial explosion, it is generally thought to have released an enormous amount of energy from a very small source because the more energy we pack into a single entity, the smaller it is. Certainly no source for a single primordial explosion other than a very tiny one has any observational support. However, in our experience, when energy is released at a high energy level from a small source the gamma-ray photons produced interact with each other and with any nearby particles to form a concentration of particles close to the source of the energy release. So our experience is inconsistent with the existence of many widely spaced concentrations of mass which is what we now observe.

Based on our experience, let us consider the probable result of a primordial explosion which is here defined as the release over a short period of time of an enormous amount of energy corresponding with the mass of at least a single galaxy.

Some of the photons released by any primordial explosion will pass through the mass of particles formed by the release of energy. These passing photons, either undiminished in energy content or after having interacted with the particles present to one extent or another will leave the site of the explosion. These interactions will cause any particle which is struck to absorb energy from the photon, and this will change the velocity of the particle while the photon involved will lose energy and change its direction. The result is almost all of the particles formed are concentrated into a single small region, and beyond that region the photons which remain move away in all directions and few additional particles are formed by the released energy.

If the energy release is very large so the number of particles will be enormous and the mass of particles will be very large, one can expect almost all of the photons will be consumed in producing particles. The gravity of the particulate mass should slow the expansion of that mass resulting from the outward motion of the newly-formed particles and the release of additional energy (by the annihilation of the antiparticles present) within the mass. Also, during the explosion some of the newly formed particles and some nuclear fragments of the mass which exploded should be propelled away at high speed, and these should move out in every direction and at various speeds.

Astrophysics ignores their experience with the rapid release of energy from a small source. Ignoring experience is obviously hazardous, but it is justified by suggesting the amount of energy released in a primordial explosion would infinitely exceed anything with which we have experience. It is thus possible (though not likely) for a primordial explosion to act differently than the energy releases known to us. But any conclusion reached about the precise nature of the single primordial explosion of the Big Bang theory not based on experience would have to involve unsupported speculation because we have little knowledge to rely upon as a basis for projection. The knowledge we do have, as has been discussed, is inconsistent with such an explosion creating the low density universe we now see.

On the other hand, if the gamma-ray bursts we now receive are primordial explosions producing separate galaxies, then the particles produced by those explosions should, per our experience, be very concentrated and initially little larger than the black hole which exploded. This would provide an immense mass in a space little larger than the hole which exploded, so it would still be a black hole. Interestingly, NASA’s Compton Gamma-Ray Satellite program which monitors these gamma-ray bursts concludes the product of a gamma-ray burst is a black hole. NASA’s other big bang-based conclusions about gamma-ray bursts have little support, but this particular conclusion is based on the failure of observation to find any new object where the burst took place, so it has basis in observation and agrees with this writer’s theory.

Astrophysics has attributed gamma-ray bursts to the supernova of a sun of immense mass, (1) but a supernova creates a persistent small zone of immense radiation (which a gamma-ray burst does not possess) and, assuming an especially large supernova would be rich in gamma radiation (whereas ordinary supernova are not), it would cause the longer bursts associated with suns of greatest mass to contain a higher proportion of gamma radiation than the shorter bursts. As pointed out in reference 1, it was a surprise having no ready explanation to learn the opposite was the fact. It is noted in passing that no supernova of unusually great mass had been observed when the conclusion gamma-ray bursts result from the supernova of an unusually massive sun was reached. So that conclusion was based on unsupported conjecture.

In September 2006 a supernova of an incredibly massive sun 240 million light-years away was observed, and it is nothing like a gamma-ray burst. No strong gamma-ray burst was noted from that vector at that time, a failure apparently attributed to the suggestion (unsupported by observation) that gamma radiation is confined to jets not pointed at us. More importantly, a strong and continuing visual luminosity was instead seen for nine months following the explosion. A gamma-ray burst leaves no such persistent visual remnant.

The Cosmological Principle

The Big Bang theory suggests production of a cosmos having a relatively uniform distribution of particles throughout space, and these particles, or the massive objects formed from the particles, should still possess some of the outward motion imparted by the primordial explosion, albeit slowed by the gravity of the universe. The mass distribution of the big bang expanding universe was thus expected to be homogeneous and isotropic. This expectation is known as the cosmological principle, and it has long been a mainstay of modern astrophysics. But is it correct?

What are the observations relating to the uniform distribution of mass? The June 1999 issue of *Scientific American* contains an article entitled "Mapping the Universe" by Stephen D. Landy which pictures the "Large Scale Structures in the Universe". This article demonstrates the universe on every scale up to a spherical volume 100 million light-years in diameter is mostly empty space, the luminous matter being concentrated into superclusters of galaxies which occupy very little of the volume of space under consideration.

If we assume the same enormous concentration of mass into a small volume which we see within 100 million light-years continues at greater distances, then most of the space within our visible universe is empty, with very little of luminous character in it. The presently available evidence suggests the universe concentrates its visible matter into about the same tiny fraction of the volume at every scale.

Cosmology today proceeds on the basis it must fit its thinking into the large scale uniformity suggested by the big bang's cosmological principle, but the real problem is to explain how most of space is empty.

Landy states:

> "The clumpiness of galaxies runs contrary to one of the essential tenets of modern cosmology: the cosmological principle, the concept that the universe is homogeneous and isotropic."

Landy later states:

> ". . . on scale of up to 100 million light-years, galaxies are distributed as a fractal . . . The fractal arrangement of matter would be a severe problem for the cosmological principle if it extended to larger scales, because a fractal distribution is never homogeneous and isotropic. . . . In short, the fractal findings seemed to pull the rug out from under modern cosmology."

Do we throw out the cosmological principle because it has encountered this inconsistency with observation? Astrophysics does not observe this imperative of science. The non-random fractal arrangement exists at every scale up to 100 million light-years, so the main reason to believe a non-random distribution of matter would not continue at larger scales is blind adherence to the cosmological principle. Stubborn adherence to pre-conceived notions shown to be inconsistent with observation is the opposite of science.

Mapping of galaxies at any greater scale is difficult, but on a scale of hundreds of millions of light-years surveys were interpreted to suggest the fractal nature of galaxy distribution broke down and became a "noise process". Hooray - the cosmological principle had been saved! However, those surveys were biased and not well done, as evidenced by the fact that, as stated by Landy:

> "A (later) high-resolution survey detected a 'Great Wall' 750 million light-years long, more than 250 million light-years wide and 20 million light-years thick. A noise process could not readily explain such a colossal and coherent structure."

Landy refers to still larger mapping projects limited to objects up to a distance of 2 billion light-years and to a few thin slices of space. The result was clear evidence of clustering on an enormous scale. The problem is the clustering found at greater distances involved much larger structures than were found at shorter distances.

Landy considered the clustering problem from the standpoint of its power spectrum and concluded a model based on the existence of dark matter does not embrace the very different power spectrum obtained at distances greater than 600 million light-years. How nice, since this writer has long refused to accept the existence of dark matter. Landy states: "From the strength of the deviation and the size of the survey, we calculated the probability of seeing such a deviation purely by chance as one in several thousand." Landy then says:

> "The association of these walls and voids with the deviation in the power spectrum is a crucial finding of the Las Campanas survey. It means that on this scale, the galaxy distribution cannot be fully characterized using the mathematics of random noise."

Another aspect of the non-uniform distribution of mass is the high density and character of objects in extremely remote space. The Hubble Space Telescope's mosaic of pictures of these objects shows an object density about 90 times greater than near us. But when there is an expansion in all directions the outermost portions should experience the greatest expansion and, hence, remote space should possess the lowest particle density and the smallest object density instead of the highest object density. The pictures show large numbers of small galaxies which should mature into the smallest galactic objects near us (the globular clusters). It is curious in a big bang universe to find the formation of large numbers of small galaxies where the particle density should be smallest, and these apparently mature into tiny galaxies, such as globular clusters, which have a density of suns as much as 1,000 times greater than that of an ordinary galaxy, such as our own.

Galaxy Clustering

An important aspect of the immense structures found in space at about a distance in excess of 600 million light-years is that these structures upset the very essence of how galactic structures must form in a big bang universe. As stated by Landy:

> "If gravity were the culprit, galaxy clustering should have begun on small scales and then worked its way up to large scales. For the past two decades, such a bottom-up scenario, . . . has been the paradigm for explaining structures on scales smaller than about 150 million light-years. Yet the deviations in our survey begin to appear

at much larger scales, but (this paradigm) cannot explain the walls and voids on the larger scales."

The bottom-up scenario for the formation of clusters of mass is entirely logical in the Big Bang theory because the process of drawing particles together to first form suns, then galaxies and then superclusters of galaxies is driven by gravity and progresses with time. This forces the extent of clustering to increase as time goes by. Since the reverse has taken place the bottom-up scenario for the formation of galactic objects is dead. The bottom-up scenario makes sense until you compare it with the observations. In science when theory and fact do not match, the theory is discarded, but as will be seen hereafter, this is not done by modern astrophysics.

In summary, the Big Bang theory does not provide enough time for a weak gravitational force (or any other weak force) to empty the enormous voids which exist between the superclusters, to organize those clusters and superclusters, or to cause the galaxies to string out around the voids. In contrast, when the weak force of gravity is to function over endless time, one universe after another as in the Universe Cycle theory, there is plenty of time for all of this to take place.

In the Universe Cycle theory this universe exists as just another in an endless series of universes, and since gravity is an attractive force one can expect it would slowly draw the galaxies together. While some progressive concentration of the galaxies over a plurality of universes seems to be unavoidable, only limited cluster concentration could occur during the life of a single universe. Nonetheless, the galaxies are very far apart, and while some collisions have taken place, the distribution of the galaxies in the universe we see is characterized by three prime factors. First, even within the clusters the galaxies are still far apart. Second, the galaxies tend to string out to concentrate around the voids and extend from one cluster to the next. In an extreme instance this stringing effect is revealed in the immense flat and linear concentration of galaxies referred to as a wall. Third, some remote voids are larger than those near us and some remote clusters are larger than those near us. This mass distribution is inconsistent with the Big Bang theory, and it is fair to ask how the Universe Cycle theory fits with the observed mass distribution?

To place the issue in perspective one must first understand broadly how gravity is provided by mass and how it is responded to. This knowledge is not available to modern physics, so astrophysics cannot take advantage of it.

Particles are formed when high energy photons decay. Since the decaying photons were moving at light speed, the concentrated energy they released to form particles must initially be moving at light speed - and there is nothing to rapidly stop the motion. So a particle consists of energy moving at light speed. The motion of the energy constituting a particle must be continuous to allow that particle to persist in time and space. Also, the amount of energy, its path of motion, and its velocity must be balanced so every particle of given type will have the same rest mass. But logic suggests the velocity must slow even if the rate of slowing is so small as to resist direct measurement.

When the velocity slows, additional energy must be absorbed from the surrounding space to maintain the above-described balance. Since absorption is a cumulative process it will produce a low energy pressure in and around any significant mass, and since the slowing action is so tiny, gravity must be extremely tiny compared to charge (as is the fact).

This low pressure is continuously generated and propagates away by contact response through the energy continuum filling space as a continuous wave to provide the gravitational field. As a result, the gravitational field is constituted by a pressure gradient which extends from a low pressure in and around any gravitating mass to the higher pressure in remote space. A pressure difference thus exists across every particle in any mass within the field, and it accelerates everything toward the low pressure source of the field.

In summary, gravity is a low pressure which propagates away from its source through the energy continuum filling space to interact with any mass by penetrating that mass to establish a pressure difference across all the particles within that mass.

Applying the above description of gravity to a black hole, the immense mass within the hole produces an extremely low energy pressure in and around the object forming the hole. Since low pressure is itself the source of the gravitational field it need not propagate to pass through the hole's event horizon to provide the known enormous gravity of existing holes. On the other hand, the energy in the space within the hole's event horizon possesses an insufficient density and pressure to enable the wave propagation needed to carry a photon away from the object within the hole. This is why light cannot exit the hole although particle jets which can move without propagation do exit the hole.

This low pressure in and around the hole also makes it difficult for a weak external gravitational field to penetrate into the hole. So black holes generate gravity, but the matter of the hole will resist responding to an external gravity to an unknown extent. It would be logical to expect the greater the mass of the hole, the poorer its response to a gravitational field originating at a great distance from the hole so as to be extremely weak when it reaches the hole.

The galaxies in our visible universe respond to gravity so the galaxies in clusters are slowly being drawn together. But when space contains only black holes of galactic mass, these retain their inertial motion but respond poorly to gravity, and hence move apart because they continue to move in the direction they were moving when these holes swallowed the galaxy around them.

Galaxy clustering and the formation of enormous voids thus result from gravitational concentration extending over many universes which have occupied this region of space, one after another. This provides the enormous amount of time needed to form superclusters of galaxies, to organize those superclusters, and to substantially empty the voids between them.

The stringing of galaxies is also a normal attribute of gravity acting when many massive objects move together in the same general direction, as is the case in the strings surrounding a void and in a wall of galaxies. The stringing action is illustrated by the motion of the outer suns in our own Milky Way galaxy and in the outer suns of other rotating galaxies close enough to enable observation. These outer suns all move together in a region where the gravity of the galaxy is very weak, so they drag the nearby energy continuum with them. The result, as Newton seems to have suggested would happen if gravity propagated through space at a finite speed (which can be expected where gravity is too weak to capture the surrounding space), is the velocity of these suns is speeded. Newton's apparent suggestion seems to be the basis for his conclusion that gravity acted instantaneously to explain the stability of the Earth's orbit.

Inertia is motion with respect to the energy continuum. The outer suns in our galaxy are observed to possess an absolute motion through space which is far too rapid to remain in the galaxy, but they remain in the galaxy nonetheless. This is because the motion of the nearby energy continuum which was dragged in the same direction by the coordinated motion of the outer suns must be subtracted from the absolute motion to obtain the inertial motion. The coordinated motions of these outer suns is enhanced by the mere fact that they are moving together because if they move out of the path of coordinated motion they enter a more slowly moving energy continuum which changes their direction of motion.

Applying the above-described capacity of massive objects to participate in coordinated motion, one must expect the suns concentrated around the voids between the superclusters to be moving together in a region of weak gravity, but we still need more time than is available in a big bang universe to achieve the large scale coordinated motions which are observed.

Because black holes of great mass retain their inertial motion, but not their full response to gravity, these coordinated motions lead, after many universes have replaced the preceding universe, to the formation of the observed large scale stringing. In an exceptional case we have the formation of elongated galactic walls of immense size and the production of superclusters and voids in remote space which, not being the result of any short-term action, can be far larger than those near us.

Accordingly, the observations make sense in the Universe Cycle theory, but they don't fit with the Big Bang theory. This inconsistency with observation provides another reason why the Big Bang theory must be discarded, and this conclusion is especially important where a competing theory explains the curious observations.

Ron Cowen in the May 31, 2003 issue of *Science News* (Vol. 163 #22 page 341) considers the clumping of galaxies which don't behave logically in the Big Bang theory. This is because it was expected a cluster of older galaxies would be drawn together over a greater length of time so as to clump more tightly, while a cluster of younger galaxies would be drawn together over a shorter length of time so as to clump less tightly. In this way, and since the clustered galaxies might be of any age, the age and extent of clumping should vary throughout the range. As stated by Cowen:

> ". . . standard theory . . . permits a continuum, from very tight to very loose clustering. The survey however, denies the middle ground."

So the logical projection of the Big Bang theory was that galaxy clusters would exist with varying ages and varying degrees of clustering. In conflict with this logical projection, the extensive survey of 2 million galaxies reported by Cowen now reveals old galaxies which are tightly clustered and young galaxies which are loosely clustered, but no clusters of intermediate age and intermediate clustering. Even in retrospect the Big Bang theory presents nothing which would force the absence of clusters of galaxies of intermediate age and density.

So a logical projection is made from the perspective of the Big Bang theory, and that projection has proven to be wrong. A scientist is required to do two things. First, he must concede that observation has established the prevailing wisdom was wrong - and this has been done. But the second essential requirement is one which astrophysics consistently avoids - and it is avoided here. A scientist must go back and find what led him and the leaders in the astrophysics community to reach an incorrect conclusion. If this is not done, and the undetected background error is maintained, it is an invitation to make additional errors, exactly as has occurred.

The difficulty here is there is only one source of the error, and that is the Big Bang theory which suggests the clustering of galaxies is initiated after the universe has been formed so a cluster might be formed at any time as a result of which the extent of clustering must correlate across the entire range with the age of the cluster. But the Big Bang theory is sacrosanct even though the methodology of science does not permit any concept to be above being tested and discarded when it fails to pass muster.

As previously discussed, in the Universe Cycle theory when matter is in the form of suns and galaxies gravity functions to progressively draw things together with time, so clusters of galaxies become more tightly clustered as they age. But when matter is in the form of black holes of galactic mass, inertia takes over and these black holes drift apart. Let us apply this concept to the puzzling lack of progressive correlation between the age and extent of clustering of galaxies.

When galactic black holes are in a densely clustered region they are relatively close together. After the central black holes have swallowed the surrounding matter, the energy in the reduced space between them is drawn into the holes and exhausted more quickly, so the aging process is speeded. This causes those holes to explode sooner than if the same holes were less closely clustered. In this way the time available for the holes to drift apart is reduced and this limits the separation caused by inertial drift when the galaxies were in the form of black holes.

So as the universe cycle repeats, the more densely clustered regions in any given portion of the universe form dense clusters of galaxies in the next universe sooner, and the less densely clustered regions form loose clusters of galaxies later. This forces the duration of the cycle of galaxy formation in these two different groups to separate because the cycle for the densely clustered group is more rapid than the cycle for the loosely clustered group. As a result, in our visible universe the galaxies in the more densely clustered regions will be older than the galaxies in the loosely clustered regions, and intermediate situations are intrinsically avoided.

George Musser in the September 1999 issue of *Scientific American* raises another curious point with respect to the clustering of galaxies. He states:

> "Observations suggest that such clusters are as common now as they were when the universe was about half its present age. This means the universe must be less dense than cosmologists once thought; new clusters have been unable to form because matter has become too diluted . . . "

Musser's conclusion that galaxy clusters were as common a few billion years ago as they are now is based on some unstated observation, but it is likely a correct conclusion as applied to clusters close to us. Turning from the clusters close to us to those in the remote universe, expansion of the universe in the past few billion years should have diluted matter in the outer portion of the universe where the greatest expansion is to be expected if we start with a single primordial explosion. But the most remote visible universe is where the Hubble's Space Telescope's pictures showed an object density about 90 times greater than here! So the postulated dilution caused by expansion has not diminished the availability of matter in the outer portions of the visible universe. This means Musser's conclusion that cluster formation did not take place because of matter dilution caused by expansion is wrong.

The galaxies and galaxy clusters have been moving outwardly in an expanding universe, but this would not prevent the outwardly moving galaxies from being drawn toward one another to form clusters with voids between them, exactly as has taken place within several billion light-years of us. Also, the expansion has not prevented galaxy clusters from becoming denser with time, for older clusters in intermediately remote space where expansion is especially rapid have been found to be more tightly clustered. Musser is forced to draw an unsupported conclusion which does not fit with the evidence because the Big Bang theory has confused his thinking.

On the other hand, this writer's Universe Cycle theory holds that cluster formation preceded the formation of the visible universe, and in that visible universe clusters become denser and more tightly clustered with time and the voids between the clusters become larger. However, as will be seen, few new massive galaxies are forming in remote space because the process which formed them has not yet reached that region, so few new galactic clusters are being formed in that space.

It is stressed that the farthermost concentration of luminous quasars is about 6 billion light-years away, and beyond that distance the number of luminous quasars is small despite the large volume of space involved. In the Universe Cycle theory these luminous quasars expand to form the more massive galaxies. As a result, few new massive galaxies are now being formed at greater distances so new cluster formation is rare in very remote space. This subject matter is discussed more fully hereinafter.

Inflation

Martin A. Bucher and David N. Spergel discuss the difficulties which have been encountered in the January 1999 issue of *Scientific American* as follows:

> "Yet there are paradoxes inherent in the big bang theory. Two decades ago cosmologists resolved these troubling inconsistencies by incorporating ideas from particle physics - giving rise to the theory of 'inflation'. But now this elaboration is itself facing a crisis, brought on by recent observations that contradict its prediction for the average density of matter in the cosmos. Cosmologists are realizing that the universe may not be quite so simple as they had thought. Either they must posit the existence of an exotic form of matter or energy, or they must add a layer of complexity to the theory of inflation. In this article we will focus on the second option."

Isn't it curious that when a long-cherished theory encounters one inconsistency with observation after another, the only options available to a professional astrophysicist do not include throwing out the theory? Those espousing the Big Bang theory have always recognized the existence of problems, but they insist their cherished theory must be maintained for lack of a viable alternative. We now see there is a viable alternative which avoids the problems which undermine the Big Bang theory, but astrophysics today stubbornly refuses to consider alternate theories.

One problem is the long-accepted concept that the stellar redshift denotes recessional motion, as does the Doppler effect with sound. There is no doubt that redshift can denote recessional motion, but Edwin Hubble in his 1939 text refused to accept that conclusion to force the expansion of the visible universe, so other conclusions are possible. As is well known, Hubble suggested redshift resulted from the progressive loss of energy from a photon traveling through the endless reaches of space, and the phrase "tired light" was coined to scorn him for that suggestion. It seems likely to this writer that redshift is a mixed bag, partially arising out of recessional motion, and partially arising out of energy loss. Let us see where the recessional motion conclusion has brought us since some remote objects have such a great redshift as to suggest motion at speeds in excess of light speed.

Bucher and Spergel acknowledge the present dilemma as follows:

> "This motion did not violate relativity, which prohibits bodies of finite mass from moving through space faster than light. The objects, in fact, stood still relative to the space around them. It was space itself that came to expand faster than light."

So observation has forced the Doppler conclusion based on momentum imparted by the single primordial explosion to be abandoned, even though the concept of empty space directly influencing the motion of bodies of finite mass has always been scorned, which is why astrophysics refused to accept the concept of an ether. So to maintain the Big Bang theory we must discard the momentum interpretation of the stellar redshift on which it was based and replace it with a concept which has traditionally been considered ridiculous. However, space does not slow the Earth as it moves around the sun, so how could it grasp galaxies and force them to move with it as it expanded? If something grasps you as it moves, it cannot avoid grasping you when you move while it is still. The concept that galaxies are moved by the expansion of space is not logical.

Bucher and Spergel then discuss the ratio of gravitational energy to kinetic energy which is identified by the symbol omega. They suggest "any significant deviation from the perfect balance suggested by inflation (identified as omega = 1.0) would have magnified itself over time". As a result:

> "After billions of years, omega should effectively be either zero or infinity. Because the current density of the universe is (thankfully) neither zero or infinity, the original value of omega must have been

exactly one or extraordinarily close to it (within one part in 10 to the 18th power). Why? The big bang theory offers no explanation apart from dumb luck."

When "dumb luck" to such an enormous extent is needed to sustain a theory, the theory must be wrong. If there were no single primordial explosion, there would be no need to be thankful for any lack of balance between gravitational and kinetic energy. Indeed if we limit our calculation to matter of the type with which we are familiar, omega is only about 0.03. If we include dark matter, which only exists when one does not comprehend what is happening, omega is increased to about 0.30. To stretch this to the value of 1.0 (which inflation demands) requires abandoning Newtonian physics upon which modern physics is based. Wouldn't you know that Newtonian physics is being discarded, as it must be to accept the concept of dark energy.

The Expanding Universe

Let us assume the visible universe is expanding because the evidence (the duration and brightness of remote supernovas) suggests it is expanding even if the observed redshift is not entirely due to recessional motion.

In the Universe Cycle theory the visible universe was created by the gamma-ray explosion of black holes. These gamma-ray explosions, the quasars which resulted from the expansion of the particulate mass produced by those explosions and the visible galaxies which the quasars expanded to form, are all energy emitting actions. The energy lost by those actions progressively reduces the mass, so the mass density within the visible universe must be less than the mass density provided by unexploded black holes outside the visible universe which are not emitting energy. As a result, space outside the visible universe has retained its mass density while the mass density of the visible universe is reduced.

Matter provides gravity in proportion to its mass, so the matter in the visible universe must be accelerating outwardly toward the region of greater mass density. This means the normal action of gravity is forcing the visible universe to expand. Expansion further reduces the mass density, enhancing the gravitational expansion. So an expansion provoked by the normal action of gravity in the Universe Cycle theory does not require any single primordial explosion to provide its cause.

The expansion mechanism discussed above provides a peculiar expansion which is quite different than the expansion suggested by the Big Bang theory. In the Big Bang theory the mass was thrown outwardly by the initial explosion and, since then, the outwardly speeding mass must progressively slow in response to the gravity provided by the visible universe. To the astonishment of astrophysics this is not the expansion which was found.

When we look around we see the same number of gamma-ray bursts, quasars and galaxies in every direction, so we must be close to the center of the visible universe. Near the center of the visible universe we are too far from the periphery of that universe for the greater mass density there to effect us, so the expansion here is now minimal and the spacing and motion of the galaxies near us is mostly the result of an expansion which took place billions of years ago (having been replaced by the gravitational interactions of the nearby galaxies). Near the periphery of the visible universe the acceleration is just starting, so the recessional motion in that location should also be small. With the expansion just begun and the acceleration small, this explains why very remote space has such a high object density.

However, at a distance of from 5-9 billion light-years we have an intermediate mass density surrounded by an unreduced mass density outside the universe, and a greatly reduced mass density at the center of the universe where the energy loss and the resulting expansion have continued for a greater length of time. So the matter at intermediate distances has a low mass density at one side and a high mass density at the other side and a great amount of time for the outward acceleration induced by the gravitational gradient generated by those density differences to accumulate and maximize the outward velocity.

One can compare the evidence establishing outward motion with the requirements of the Big Bang theory and the Universe Cycle theory. That evidence now establishes the matter in intermediately remote space is moving outwardly far faster than had been estimated based on the gravity of the visible universe slowing the big bang-induced expansion, so it is the Big Bang theory which has failed to match the observations, while the observed velocity situation fits nicely with the requirements of the Universe Cycle theory.

The Age of the Universe

The distribution of mass we observe tells us something about the age of the universe which, in the Big Bang theory, is now calculated (from non-uniformities in the background radiation) to be about 13.7 billion years. Let us first consider mass distribution from the perspective of the Big Bang theory as initially promulgated which accepted light speed as limiting motion through space, as it certainly does at this time.

It would take the particles formed by the primordial explosion at least 13 billion years to move away from the site of the explosion at light speed to reach a distance of about 13 billion light-years from our position somewhere near the center of the visible universe. Indeed, we observe many newly formed small galaxies at what we now believe is about the stated great distance, albeit we also observe (by infrared astronomy) a cluster of old galaxies at almost the same distance. The problem is it would have taken 13 billion years for the light from those remote galaxies to reach us from where that light originated. This provides galaxies which are at least 26 billion years old at the present time, a ridiculous conclusion in a universe which (as now estimated) cannot be more than 14 billion years old.

But the facts are worse than discussed above. The particles which initially moved away from the site of the explosion had to slow as they moved away against the universe's gravity, so those particles or the bodies which they formed must have taken far more than 13 billion years to reach the remote position from which their light was emitted. At least this would give us slowly moving particles which might come together to form suns and galaxies. But this demands a universe far more than 26 billion years old.

It should now be apparent that if there were a big bang it must have had an inflationary beginning, for otherwise what we see in remote space must be far older than the big bang universe of which it is supposed to be a part. But the difficulty with an inflationary universe is just as bad as the obvious age-based inconsistency which has been discussed, for inflation theory demands we ignore all of our experience with the motion of objects which is limited to light speed.

Let us assume the inflationary start instantly produced a universe of photons and particles half its present size. In this way after the first brief period of inflation the universe was about 7 billion light-years in radius at which point the light speed limitation on motion velocity became effective. 7 billion years later (assuming motion at light speed without slowing), when the most remote objects we see were formed, they were about 13 billion light-years away from our central position emitting the light we now receive. This would give the particles almost 7 billion years to slow and form galaxies, but that would provide galaxies at least 20 billion years old. That is also impossible in a universe which the Big Bang theory asserts cannot be more than 14 billion years of age.

Let us instead suppose the inflation instantly produced a universe about 13 billion light-years in radius and we now see light from very remote objects formed about one-half billion years later, albeit how particles moving at close to light speed might be slowed so quickly by the very weak force of gravity that they could associate with one another to form suns and widely spaced galaxies is not comprehensible. But it is only with this illogical postulate that we obtain a universe having the correct age.

The age of matter in very remote space destroys the Big Bang theory regardless of whether one relies upon inflation or not.

The Divergent Ages of Galaxies

In a big bang universe we can expect to find galaxies of different ages in any particular portion of space for there is nothing to demand they all be formed at the same time. Thus, in our region of space some of the galaxies are younger and some older, but we have found none near us older than 14 billion years which is the upper limit for the age of the big bang universe. But is this true in other regions of space?

The Abell 851 cluster of galaxies is about 4 billion light-years away from us, so in a big bang universe one expects the oldest of those galaxies will be roughly 4 billion years younger than the oldest galaxies in our region of space. When that cluster was first observed the prevailing wisdom was spiral galaxies were younger than elliptical galaxies. So when it was discovered that the proportion of spiral galaxies in the Abell 851 cluster was greater than in our region of space, astrophysicists exulted because it provided a rare observational support for their Big Bang theory. This writer never agreed, instead accepting Hubble's conclusion that among the galaxies of ordinary size the elliptical galaxies were the younger ones, rotation of these galaxies causing progressive flattening of the galaxy with time until spiral arms formed.

Hubble's conclusion was based on observation because he had found, on average, the smaller the galaxy the flatter it was. So gravity reduced the size with time while rotation threw out the equatorial regions to flatten the galaxy. This writer's conclusion was based on his theory because if a gamma-ray burst produced the galaxy, it had to start as a small spherical object with rotation beginning as the galaxy contracted after it had exhausted its initial expansion.

With Hubble's observations and theory coming together, this writer was convinced astrophysics was wrong about the age Abell 851.

Support for this writer's conclusion about the age of the galaxies in the Abell 851 cluster came from its great density. Gravity causes galaxies to draw together, so increased density suggests an older cluster, and this suggestion has been confirmed by observation of many clusters of galaxies. The greater density of the Abell 851 cluster thus demanded it be several billion years older than our galaxy. Sure enough, subsequent observation of very remote galaxies established that the early galaxies included very few of spiral form so galaxies of spiral form are old ones, just as Hubble concluded.

So we have galaxies about 4 billion light-years away which are several billion years older than ours. Since our galaxy is at least 11 billion years old, this means the Abell 851 galaxies are now at least 17 billion years old, and this is clearly inconsistent with the presently accepted age of the big bang universe.

In the March 1, 2003 issue of *Science News* (Vol. 163 at page 139 et seq.) Ron Cowen writes about the findings obtained during the fall of 2002 and the early spring of 2003 of mature galaxies in extremely remote space. It is stated:

> "Using one of these large-format infrared cameras on a high-precision telescope in Parnal, Chile, astronomers recently examined the Hubble Deep Field South, a patch of sky that previously had been viewed by the Hubble Space Telescope . . . "
>
> "Two findings surprised the astronomers. One was that their data suggest that when the universe was only 2 billion years old, as much as half of its stellar mass resided in galaxies brimming with mature stars. That's in sharp contrast to the surveys of distant galaxies recorded in visible light, which have imaged the relatively small population of stars that were young and hot."
>
> "Franx and Labbe (Maijin Franx and Iwo Labbe of Leiden Observatory) also found that some galaxies from this long-ago epoch were already unexpectedly large. Some even show spiral structures similar to those seen in other galaxies, including our own, today."

So with the aid of a new large-format infrared camera we now know some things we did not know before. First, some of the extremely remote galaxies are large, emit infrared light and exhibit structure which is logically associated with galaxies of considerable age. This is nonsense for remote galaxies which, in big bang thinking, must be less than 2 billion years of age. Second, a densely populated region of extremely remote space exists which contains a large proportion of mature galaxies. This is also nonsense in big bang thinking. However, and as will appear, there is a third finding (ignored by Cowen) which is even more disturbing to conventional thinking than the two noted here.

Let us first consider the point stressed in Cowen's article. It is there pointed out that:

> "One caveat, Labbe notes, is that Hubble Deep Field South is an extremely tiny patch of sky, taking up less than 1 percent of the area of the full moon. There's no consensus on whether the galaxies there are representative of the universe at large. . . . Indeed, near-infrared observations of another tiny patch, known as Hubble Deep Field North, don't show a similar population of old or large galaxies, notes Mark Dickinson of the Space Telescope Science Institute in Baltimore."

So the first point to be considered is the need for a "consensus". One is always interested in expanding the base of observation, but what we are considering here is the question of whether what was found in very remote space is consistent with the prevailing Big Bang theory? That question is resolved by the existence of a very remote region of space filled with galaxies many of which are larger and older than is possible in big bang thinking. The further question of whether such a region of space is typical or not is not involved in the resolution of that primary question.

The additional point is the difference between the many galaxies found in Hubble Deep field South and Hubble Deep Field North. In the South Field many of the galaxies are large and old. Such galaxies are not present in the North Field! What we have found is that dense regions of galaxies in extremely remote space can differ widely, at least one being quite young and at least one being far older than is consistent with big bang thinking. The fact that one is young and the other is old is even more inconsistent with the existence of a single primordial explosion than the excessive age of the older galaxies. If the single primordial explosion created dense remote regions filled with galaxies, those dense remote regions would have to be similar to one another because they would have to have been formed at about the same early time, and having the same source in the early universe should have much the same character. So the galaxies in one region could not be small, round and young, while the galaxies in the other region were large and old.

The issue of a consensus is resolved by the previous discussion of the dense cluster of galaxies known as Abell 851 where we find galaxies which are very old in a region of space where many of the galaxies are at least 7 billion years younger.

Dark Energy

To this point it should be clear that modern astrophysics has failed to make sense out of what astronomy has revealed in the distribution of mass in the cosmos. But is the confusion which has been discussed generated by this writer's perspective, or is the confusion real and something which astrophysics is now recognizing as a result of observations which have forced a reconsideration of existing positions?

To answer the above question, all one need do is to review the latest thinking about something called dark energy to see that astrophysics is now in the midst of an upheaval brought about by the most recent observations relating to the distribution of matter and its motion through the cosmos.

Let us consider the February 2007 issue of *Scientific American* entitled "The Universe's Invisible Hand" by Christopher J. Conselice which suggests dark energy may be the key link among several aspects of galaxy formation that used to appear unrelated. The clustering of galaxies discussed herein is now asserted to be one of the more significant effects of that dark energy. It is noted in passing that this 2007 article ignores many of the observations and it twists others until one must wonder what the facts really are. To illustrate how reliable its conclusions are, it advocates the bottom-up scenario which was discredited by Landy, as discussed previously, and it ignores the enormous wall structure and the existence of larger clusters far from us which have also been discussed.

One must ask: what is dark energy? The 2007 article states:

> "Dark energy is best known as the putative agent of cosmic acceleration. An unidentified substance that exerts a kind of antigravity force on the universe as a whole."

This description thus suggests we abandon Newtonian physics based upon the asserted existence of "an unidentified substance" which is to act in an un-described manner and which is to function in a manner which is different from the action of any force known to man. This is obviously inadequate and we can now appreciate why this energy is described as "dark".

One of the most striking problems which flows out of the presence of some mysterious energy filling space is the creation of an "antigravity force".

Gravity is directional, everything being attracted toward greater mass. We do not have to ask which way gravity will act because it always accelerates things toward greater mass. Since galaxies in intermediately remote space are accelerating outwardly, Newtonian physics demands there be a greater concentration of mass outside the visible universe (as demanded by this writer's theory), but this would destroy the Big Bang theory in which there is nothing outside the visible universe. So Newtonian physics is sacrificed to maintain preconceived notions.

If dark energy in space were to exert a pushing force, as is asserted, which way should it push? If dark energy were involved in the formation of galactic clusters, as asserted in the 2007 article, it would have to push galaxies toward the center of mass where those galaxies are being concentrated in a cluster because gravity, even when supplemented by dark matter, is not strong enough to do the job in the available time. On the other hand, if dark energy were to expand the universe, it would have to push the galaxies outwardly away from where the galaxies are concentrated near the center of the universe.

So astrophysics has conjured up a force which matches the direction of the cosmological actions we see only because that is what is glibly asserted. This is a poor basis upon which to reach scientifically defensible conclusions.

As a matter of interest, the 2007 article suggests dark matter is concentrated in blobs (referred to as halos even though a halo is a toroidal object required to have that structure to act on the outermost suns in our galaxy and not on the inner suns). So with "halos" curiously forming galaxies which are not toroidal, dark matter is speculated to have helped form the galaxies, but these widely separated halos could not form clusters of galaxies in a short period of time because dark matter is suggested to not be much more powerful than gravity.

The 2007 article suggests this dark energy "is spread smoothly everywhere". In our experience with anything filling space, such as air, to accelerate anything in any direction, one must have a pressure difference or some coordinated motion. If dark energy is spread smoothly, as asserted, it cannot move any ponderable object in any normal manner.

The article suggests observation shows “the expansion (of the universe) . . . had been slowing down but at some point underwent a transition and began speeding up.” On its face, this transition destroys the Big Bang theory which demands continued slowing due to gravity. Forces which act differently at different times or in different portions of the cosmos boggle the mind, especially when the action enabling this to happen is not explained.

Let us now address the question of whether dark energy “choked off” the growth of galaxy clusters some six billion years ago as the 2007 article suggests. This suggestion means something prevented the formation of new clusters which would exist at a distance of more than about seven billion light-years from us if they had not been “choked off”.

The tri-modal distribution of the gamma-ray bursts and the two regions in which the luminous quasars are concentrated, suggest the process of forming dwarf or normal sized galaxies has not yet reached a distance greater than about 6 billion light-years from us. So as more fully discussed later, nothing “choked off” the formation of clusters of galaxies beyond 7 billion light-years distance. The substantial absence of such clusters in these remote locations is the simple result of the failure of the process which produces most of the more massive galaxies to as yet reach beyond 7 billion light-years. Since massive galaxies are the stuff of which clusters of galaxies are made, their small number in remote space directly explains the small number of galaxy clusters in that space.

To support the concept that dark energy choked off the growth of galaxy clusters, the 2007 article states: “Most of the stars that exist today were born in the first half of cosmic history,”. This twists the facts to suggest that something ongoing was “choked off” and thus stopped. We get some idea of what is actually known when we note the article further states: “Since the universe was half its current age, only lightweight systems have continued to create stars at a significant rate.” So the fact is that only a few of the more massive galaxies were formed at a distance of more than seven billion light-years as required by this writer’s theory in which the gamma-ray bursts form the quasars and the quasars expand to form the galaxies. The article’s assertion that most stars were born in the first half of cosmic history twists the observations to have them mean something which is quite different from the fact.

The concept that space is expanding and hurling the galaxies outwardly as it expands relied upon by Bucher and Spergel is also relied upon in the 2007 article and is inconsistent with simple logic, as previously explained.

It should be noted that the 2007 *Scientific American* article concedes dark energy requires a new physics, but it does not present any candidate theory for consideration and thus is obviously and importantly incomplete.

More particularly, the 2007 article suggests ". . . different laws of gravity apply on supergalactic scales than on lesser ones, so that galaxies' gravity does not, in fact, resist expansion." The article then recognizes the inadequacy of that suggestion and states: "the more generally accepted hypothesis is that the laws of gravity are universal and that some form of energy, previously unknown to science, opposes and overwhelms galaxies' mutual attraction, pushing them apart ever faster." This provides a force which is absent here, but which "adds up to the most powerful force in the cosmos."

Of course no suggestion is made as to how some invisible something in space might overwhelm gravity and push entire galaxies around. Nothing near us which does not have its origin in matter has any influence upon the motion of ponderable objects. Moreover, if the only function of dark energy were to push the galaxies apart, it should expand the superclusters, but remote superclusters have been found and these are contracting.

It seems clear that the recent reliance upon dark energy to explain the otherwise unexplainable actions observed in the cosmos suggests astrophysics has conceded its past explanations are inadequate and, moreover, by abandoning Newtonian physics has abandoned the effort to understand.

The Large Scale Structure of the Universe.

It was previously noted that in this writer's Universe Cycle theory the galaxies are formed by the explosion of black holes of galactic mass. These explosions first form dense particulate masses which are black holes, and these holes expand because of the momentum imparted to the particles by the original explosion and also because of the formation of gamma rays by the annihilation of the antiparticles contained within the particulate mass. When the mass of particles is large enough to allow light to escape we have a gamma-emitting quasar which ultimately expands to form the bright galaxies we see. As should be evident, the longer the explosion, the more particles in the dense particulate mass, and the larger and more massive the galaxy which is ultimately formed.

As pointed out by this writer (2), when we graph the number of gamma-ray bursts against their duration, we obtain a tri-modal curve. In the largest group the bursts are the faintest and shortest, and this correlates with the large number of small objects found in extremely remote space. It is concluded that these matured into the large number of globular clusters which have been captured by our own and other nearby galaxies. In the second largest group the bursts are of intermediate duration, and in the third and smallest group the bursts are those having the greatest duration. It is concluded that the bursts of intermediate duration mature into the large number of dwarf galaxies and the smallest group of bursts having the greatest duration mature into the relatively small number of full-sized galaxies, such as our Milky Way galaxy.

Turning to the quasars which are concluded to be the product of these bursts, the visible quasars (which are closer and possess greater mass) are concentrated in two zones. The largest concentration of quasars is positioned about 3 billion light-years away, and the second largest concentration of quasars is positioned about 6 billion light-years away. If all quasars intrinsically possessed about the same brightness, then the quasars 6 billion light-years away should be about four times dimmer than those 3 billion light-years away. Instead, the quasars in both of these concentrations have roughly the same brightness. Consistent with this curiosity, the energy in the two longest groups of bursts have roughly the same energy content. This provides a reason why the smallest group of longest bursts which form quasars which are more massive and brighter and mature into the full-sized galaxies are concentrated at a distance of 6 billion light-years from us while the second and more numerous group of longer bursts produces the larger number of smaller and less luminous quasars which mature into the larger number of dwarf galaxies.

So we have three concentrations of bursts which form three expanding zones of galaxy formation. Since the two concentrations of quasars at 3 and 6 billion light-year distance form the larger galaxies, beyond 6 billion light-years most of the galaxies should be of small mass because the process which forms most of the larger and more massive galaxies has not yet reached beyond that distance. While this was intrinsically demanded by this writer's theory he was unaware of the fact, but it is now understood this is the fact although nothing in modern astrophysics other than this writer's theory demands it. It is here noted that Musser's conjecture is inconsistent with the high density of objects in remote space.

At the same time, since the process which forms the dwarf galaxies has not yet reached beyond 3 billion light-years, the ratio of dwarf galaxies with respect to the full size galaxies near us should be higher than it is in the region from 3 to 6 billion light years. Since the fact here is not known to this writer, this is a prediction which should be checked against pictures taken of space at various distances.

Summary

This writing has now considered the distribution of mass from several different perspectives and it is submitted that a great deal has become apparent about the character of the visible universe in which we find ourselves and the cosmology which formed that universe. However, nothing has been found which supports the Big Bang theory or what can now be described as the prevailing wisdom. In contrast, this writer's Universe Cycle theory appears to fit the available observations.

REFERENCES

1- Gehrels, N. *et al.* Scientific *American*, December 2002

2- Gulko, A. G., "Two Competing Cosmological Theories" *Infinite Energy* magazine pp 31-39, especially pp 37-39 (2005)

Nov. 2008

Arnold G. Gulko
1835 Arcola Ave.
Wheaton, Md. 20902
E-mail Aggulko@aol.com
Website http://members.aol.com/Aggulko