

A Scientific Enquiry
into the Claims of the Urantia Book

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I first heard of the Urantia Book ~~many years ago~~ when I was in graduate school. Two friends, whom I respected personally and intellectually, were surprisingly enthusiastic about the book and suggested I read it. As I began the reading I was struck by the ~~the~~ boldness ~~of the book~~. "It certainly speaks with authority," I thought. I found it interesting and I wished then that I had more time to explore this strange work. But I did not see how ~~this book~~ could be of any use to me personally or of any benefit in my pursuit of an academic career. So I dismissed it as the product of a clever and creative religious mind, which, like most "personal revelation" of this sort, would have little impact on the history of religion. But my curiosity had been aroused and so when I saw that there was going to be a consultation in the AAR on this work, I was grateful and eager to participate. But as I began to prepare for this meeting by reading parts of the book, I had the same difficulty as I had had before. Again I was struck by the boldness of the book. I thought "If this book is really what it claims to be then certainly I and we as students of religion should be studying it with great intensity and expectation. For ~~the~~ Urantia Book maintains that it is a collection of papers given to the people of urantia (earth) by the "Orvonton corps of truth revealers" in order that the people of this planet may understand, as best they are able, the nature, meaning, purpose, and history of this universe of universes of which they are a part. The historical material in this book is not a reconstruction based on partial information. It is not a "best estimate" of what happened and why it happened. It does not tell us a history; it tells us the history of our world. The information in this book comes from "first-hand"

"eye-witness" accounts of what actually transpired as our universe evolved and ^{an explanation} why it evolved in precisely the way it did. Indeed, if the Urantia Book is what it claims to be, we, who seem to be the first to have discovered this treasure for the academic-scientific community, are in many ways similar to those fortunate scientists in Clark's 2001: A Space Odyssey who found ^{on the moon} the black monolith ~~on the moon~~ which confirmed the existence of superior beings in the universe. And we, like they, should use every resource at our disposal and should direct all of our energy toward the understanding of this truth and to the sharing of it with our fellow Urantians.

But, like many of you I'm sure, I could not shake the suspicion that indeed it is not what it claims to be. I doubted that the information contained herein had been sent or brought to earth by "truth revealers" or any other strange or wonderful beings. ~~at all~~ I suspected, I ~~even believed~~, that the information came from the mind(s) of a human being who probably lived in this country during the first half of this century. So strong was the conviction that this second hypothesis is valid that there was an inclination on my part to accept it without further investigation. But I realized that such acceptance would be improper since it was based on subjective considerations. Furthermore, my curiosity was again aroused. So I searched the library for reviews of this book and found none. Then I wrote to the Urantia Foundation and asked them to give me further information on how, when, and by whom the material in this book was received. When after weeks I received no reply I wrote again, but to this point I have obtained no information from them. So my attempt to substantiate my hypothesis regarding the authorship of this book was undermined from the beginning

and I realized that if I were going to learn anything about this text I would have to do it by studying the Urantia Book itself.

A. Testing of First Hypothesis

I decided that my next step should be an attempt to test the first hypothesis, viz. the possibility that the Urantia Book is what it claims to be. Fortunately for my purposes, it was clear that this testing could be done in a rather straightforward way. For if this book is what it claims to be, that is, a first-hand objective record of the history of our world, then every statement in the book must be ^{accurate} true, every conclusion must be valid, every event described must have happened in just the way and at just the time as the "truth revealers" say. If the book is what it claims to be then labels such as "myth," "parable," "metaphor," "inspired creation," etc., which academicians generally apply to religious literature are not at all applicable. But labels such as "accurate," "truth," "fact," "reality," "actuality," etc., which academicians often use in reference to scientific literature are applicable. So if I could prove that any statement in the book is not true, or if I could demonstrate the inaccuracy of any conclusion, or if I could determine that any event described in the book could not have taken place in the manner in which or at the time that is recorded in the book, then I would have good reason to doubt ~~doubt~~ the validity of "the urantia hypothesis." And since we in the academic community generally agree that the conclusions of scientists, especially physical scientists, have the highest probability of being true of any human statements, it seemed to me that the best way to test the validity of the urantia teachings was to compare them to the theories of contemporary science. Specifically I choose to compare

what the Urantia Book says about (a) the origin of life on Urantia, (b) the origin of Urantia itself, and (c) the origin of the universe to the explanations which contemporary science gives for these three critical events.

1. The Origin of Life on Earth

The Urantia Book states that 600,000,000 years ago the Life Carriers came to Urantia and found that conditions were not yet suitable for the evolution of life to begin here. But fifty million years later they returned in order to "oversee" the beginning of life on this planet. Contrary to their usual practice, the Life Carriers did not have to bring living forms with them. Rather they were able, by using the material of Urantia along with local "spiritual force and supraphysical powers" to "organize and initiate the original life patterns of this world," (pp. 664, 667).

In 1981 Nobel Laureate Francis Crick published a book called Life Itself: Its Origin and Nature¹ in which he expresses his conviction that there are at present two plausible scientific theories which adequately explain the origin of life on earth. The most widely accepted or "orthodox" theory claims that life arose spontaneously from the inorganic soup of the young earth's oceans. Crick, however, favors a theory which claims that life was implanted here by the representatives of a highly evolved civilization. These ancient astronauts had both the knowledge and the technology to bring the seeds of life to earth, ^{as well as} and to plant them on other suitable planets in our galaxy. In his book Crick maintains that this theory, which he calls "directed panspermia," is just as likely to be true as the orthodox "spontaneous generation" theory and that the level of our

present knowledge does not enable us to choose between the two.

Clearly the description of the origin of life given in the Urantia Book is not incompatible with either of these theories. As a matter of fact, the Urantia explanation contains many ^{acceptable} acceptable elements of the two scientific theories without suffering some of the objectional implications of either. One of Crick's reasons for supporting implantation rather than spontaneous generation as the explanation for the origin of life is that there appears to be a clear discontinuity between the content of the primordial soup of earth's young oceans and the very earliest constituents of the post biotic earth. He believes that given what we now know about this critical period of earth's history it is highly unlikely that life could have arisen without external support of some kind (Crick, pp. 141-143). According to him, this "external support" came from evolved intelligent creatures who either brought or sent the seeds of life to earth.

Obviously the "Life Carriers" of the Urantia Book could have performed this task as well as ancient astronauts or their material representatives. Moreover, the "Life Carrier" theory is free from the principle objection to the implantation theory. In order to establish "Directed Panspermia" Crick must overcome a difficulty of chronology. Scientists believe that the universe is about ten billion years old, and they are convinced that it has taken life on earth about four billion years to evolve from prebiotic soup to man. Furthermore there is good reason to believe that the universe could not have supported life of any kind during its first four billion years. Hence Crick's hypothetical "life implanters" would have had to be the product of an evolutionary process which would have progressed well beyond man's present state in about two billion years, or at

more than twice the rate of evolution on earth--a prospect which seems rather unlikely (Crick pp., 144-146).

In addition to chronological difficulties, Crick's theory must overcome apparently insurmountable physical difficulties. Given the present state of our knowledge there is no way to explain how life could have been transported over the vast distance necessary for and in the time allowed by his theory. The reason for this difficulty is that material things cannot travel faster than the speed of light and at sub-light speeds the time required to transport life and life support systems across galaxies makes Crick's theory seem highly implausible.

However, it is clear that the Urantia Book's "Life Carrier" theory is not affected by the difficulties. The Life Carriers are created beings and need no time to evolve. Moreover they are spiritual beings who use spiritual powers and forces and who, being without mass, are not subject to speed of light restriction which governs all material reality. Indeed, given the apparent radical discontinuity represented by the beginning of life on earth, which, it will be recalled, is Crick's primary reason for looking toward an implantation theory to explain life's origins, and given the time periods and vast spaces involved, if indeed science is correct in its present estimates, it would seem that the implantation theory described in the Urantia Book is more likely to be true than the one Crick accepts.

Similarly, it can be seen that the Life Carrier theory compares well with the orthodox scientific explanation of the origin of life through spontaneous generation. To demonstrate this I would like for you to imagine what the experience of a scientist, that is, an objective

intelligent observer, would have been had one been ^{present} ~~around~~ when the Life Carriers were performing their task on earth. Obviously the Life Carriers themselves would not have been observed, since they are non-material beings, and neither would the presence of "spiritual powers" and supraphysical forces have been detected. The only thing our ancient scientists would have observed is that due to certain alterations that took place simultaneously at three different ^{locations} ~~places~~ in the earth's oceans, chemical compounds appeared which had the ability to reproduce themselves and evolve. And this is essentially what the orthodox theory predicts ~~that~~ an objective observer would have experienced. So the Life Carrier theory is not incompatible with the theory of spontaneous generation, it merely supplements it and, some might even say "enriches it."

If the matter of life's origin could be left here, the Urantia Book would ^{fair} ~~do~~ very well, but to this point I have neglected to mention the "fatal flaw" of the Life Carrier theory. According to this theory the evolution of life on Urantia began five hundred and fifty million years ago; before this time Urantia was a lifeless planet. ^{But} According to evidence gathered by scientists this could not be correct. Scientists have discovered microscopic fossils which are about 3.5 billion years old. The Urantia Book appears to have neglected almost three billion years of evolution. An error this substantial could not be made by genuine truth revealers.

Given this vast discrepancy between what we know to be the facts and what the Urantia Book claims, we could draw the conclusion that the Urantia theory has been refuted. However, such a conclusion might be premature. Even though it appears that micro-organisms

have been on earth for perhaps as long as four billion years it is also the case that macro-organisms did not appear until about six hundred million years ago. So if one were willing to say the origin of life ^{coincides} with the appearance of multi-cellular organisms, which evolve more rapidly and with greater complexity than their single celled forerunners, then the date given for the origin of life in the Urantia Book is more acceptable. Of course at this time there is no good scientific reason for doing this. (But if the Cains-Smith theory which claims that life began as clay crystals is correct, Scientific American, June 1985, pp. 90f., there might be reason to re-evaluate what we mean by the origin of life.

2. The Origin of ^{Our} ~~Our~~ Planet

The Urantia Book says that until about 4.5 billion years ago, our sun was a solitary orb, floating alone through space. At that time the massive Angona system passed near the sun and drew large portions of the ^{sun's} ~~same~~ material out into the surrounding space. The gravitational pull of the Angona system was not sufficiently strong to capture any of the solar material, but it was powerful enough to cause large portions of the ~~solar material~~ [;] to achieve stable orbits at discrete distances from the sun, in a plane of rotation which was defined by the position of the ~~relatively stable sun vis a vis~~ vis a vis the passing massive system. Through condensation, cooling, and gravitational activity different portions of this orbiting material coalesced to form the 12 planets which along with the sun ~~itself~~ make up our solar system (pp. 655-658).

In the discussion of the origin of life on Urantia it was seen that the Urantia explanation was not incompatible with either of the

two methods accepted by science, but it radically differed with the scientific explanation with regard to time. In the case of the origin of the planet, the reverse is true. The Urantia date for the origin of the solar system, i.e. about 4.5 billion years ago, agrees with the date accepted by most contemporary astronomers.² But the method by which the planets were formed according to Urantia has been rejected by today's scientists. Current theory ~~rejects the idea~~ ^{denies} that the sun was once alone and postulates that all the material in the solar system was for billions of years contained in a slowly rotating nebula of hot gases. However about 4.6 billion years ago a supernova exploded near enough to the gaseous nebula to cause the cloud to distort and begin rotating more rapidly, with the axis of rotation being determined by interaction between the explosive force and the pre-explosion angular momentum of the protosolar nebula. In time, due partially to gravitational forces but more importantly to angular momentum and magnetic field interaction (conditions which the Urantia Book fails to mention) the disk-like nebula coalesced first into a number of rings, like those around Saturn, and then into orbiting planets and other debris.³ So, ~~as before~~, it is seen that while the Urantia Book is rather accurate regarding the date of earth's origin, it is in error regarding the method of origin, primarily because it fails to take into account considerations of angular momentum and magnetic field.

3. The Origin of the Universe

Since, according to the Urantia Book, all reality exists eternally in the mind of the Universal Father, it would be misleading to talk about the origin of the universe in any absolute sense. However, the

book does tell us that the physical material out of which our part of the universe has evolved was "initiated and ordered by the Paradise force organizers" 875 billion years ago. We are not given the details of how this magnificent creative act was performed, we are merely told that force organizers caused the great "whirl of energy," called the Andronover nebula to be set into motion. And as the force organizers withdrew from this vast whirl at right angles to its plane of rotation, the energy nebula began to develop physical systems which in time became Orvonton, one of seven "superuniverses" which revolve around the eternal central universe Havona--"the dwelling place of the eternal God," (pp. 2 and 652-653). About 500 billion years later Michael of Nebadon, a creator Son of Paradise (better known to us as Jesus of Nazareth) chose a part of Orvonton in which to build the local universe Nebadon which now contains our solar system, Monmatia (pp. 654-655).

Earlier when we looked at the Urantia Book's description of the origin of life we saw that it was compatible with scientific theory in its method but grossly in error in its chronology. And when we looked at the Urantia description of the origin of the planet we found that its chronology was essentially correct but that the method it described had been rejected by science. But when we compare its description of the origin of the universe with that accepted by current scientific theory, we see that the Urantia Book is wrong in both method and chronology. Almost all scientists today believe that the physical universe ^{originated} began some 10-20 billion years ago when highly compacted mater exploded and began spreading throughout space. Confidence in this "Big Bang" theory comes from a great deal of supporting data including the fact that the universe is observed to be

continually expanding and that, due to recent developments in elementary particle physics, scientists can now describe in considerable detail and with amazing mathematical rigor exactly what happened during the very early moments of the big bang.⁴ Given this theory it is absurd to speak of more than one universe and it is equally wrong to claim that the material out of which ^{the} ~~one's~~ world is constructed could have been around for 400 billion years--10 billion is probably more correct and 20 billion is the earliest possible.

So at this point ^{it can be said} I ~~can say~~ with confidence that if we ~~accept~~ the theories of contemporary science ^{are accepted} as normative, ^{we may} ~~we may~~ conclude that the hypothesis under investigation has been ~~substantially~~ refuted. If science is correct ~~in its~~ regarding the times of and means by which the universe, the earth, and life on earth came to be then, the Urantia Book cannot be what it claims to be, viz. a true history of our world.

B. Testing of a Second Hypothesis

Having shown that the Urantia Book cannot be what it claims to be I now offer evidence in support of a second hypothesis, viz. that the book is the creation of a person or persons living in the first part of this century. Without direct evidence it is not possible to establish this hypothesis with certainty, but through indirect evidence I believe I can demonstrate the likelihood that ^{of its validity} ~~it is valid~~. To do this I ask the question, "Do the teachings of the Urantia Book regarding the origin of the universe, the earth, and life on earth agree with what a well informed person living in the first half of this century might have believed to be true?" I have shown that according to the conclusions of contemporary science the Urantia Book contains incorrect information. But if I could show that what is now regarded as incorrect was not so regarded in the first half of this century, I

could consider this as evidence to ^{suggest} my contention that the book is a creation of someone living during this period. In order to do this I decided to review ^{all} ~~the~~ articles on pertinent subjects in Scientific American from 1900 to 1950. ~~X~~ I did this on the assumption that in this country this publication represents a consensus of what is accepted to be scientific truth at a given time and on the additional assumption that a well informed person would have access, either directly or indirectly, to this information. To my delight I found that the "errors" in the Urantia Book would not necessarily have been considered errors before 1950.

It was pointed out earlier in this paper, that according to the estimates of contemporary science the Urantia Book is incorrect in the ~~date~~ ^{date} it gives for the origin of life; it claims that life ~~was~~ began on Urantia 550 million years ago, but science now tells us that the date was about 3.5 billion years ago. But in an article published in Scientific American in 1949, ⁵ there is a chronological chart of the evolution of life with which the Urantia Book does not substantially disagree. In reading this article I was surprised to learn that the dating of life's development, which is now considered rather precise, was very uncertain at that time. Dating by the measurement of radioactive decay was being used by this time, but there was considerable disagreement as to how to interpret the data so that substantial discrepancies in dating were possible. Moreover it was clear that whereas scientists were aware that microscopic life existed prior to 550 million years ago, one could easily conclude that these "proto-life" forms were rather insignificant. Science tends to consider insignificant that about which it has no data, and it was difficult

if not impossible to study microscopic fossils before the development of the electron microscope, which was not widely used until the late 40's and early 50's.⁷ Hence it is conceivable that a layman living in the 30's and 40's could have drawn the conclusion that "Pre-cambrian" or microscopic life could be ^{ignored} improved in describing life's development on earth. Such a layman would have merely been following the example of some scientists of his time.

Earlier we observed that whereas the date given by the Urantia Book for the origin of the planet is correct; Its description of the means by which the planets were formed is ^{incorrect} inaccurate. However, articles in Scientific American during the period in review show that the Urantia Book was in agreement with the science of this time. Until the late 40's the most acceptable theories explaining the origin of the planets were the so-called "encounter theories." It was believed that either the sun had had some of its material drawn away from its surface by "tidal attraction of a passing star," (This theory proposed by James Jeans in the 20's is substantially the same as the Urantia theory) or that the sun had captured some material through a collision with some other body. It was not until 1939 that an article appeared entitled "A Famous Theory Weakens" that there began to be some doubt expressed about the accuracy of these prestigious theories. And even at this time the theories were not refuted, they were only reexamined and some weaknesses were exposed. Hence, given the state of accepted scientific knowledge prior to 1950, we can easily imagine that the hypothetical author of the Urantia Book could have believed that the explanation given by the "truth revealers" did not differ substantially from that of science.

Finally, it was shown earlier that the teaching of the Urantia Book regarding the origin of the universe disagreed with current scientific theory in both method and chronology. However, writing on the question of the origin of the universe in 1980, Joseph Silk, a professor of Astronomy at Berkeley, says that just twenty years ago it was impossible to answer the central questions of cosmology and cosmogony with any degree of certainty.⁹ My review of Scientific American articles from 1920 to 1950 convinced me that Silk is correct--at least as far as science in America is concerned. I found no articles dealing substantially with the question of the origin of the universe during this time. As a matter of fact in 1939 Henry Russell, the Harvard astronomer, states that such theories could not be accurate because not enough data was available. At that time scientists simply could not observe enough of the cosmos to propose respectable theories.¹⁰ (I strongly suspect that Russell was writing primarily to gather support for larger telescopes. The 200 in. Mt. Pulmer telescope was built in 1941.) The "Big Bang" or "nucleogenesis" as the theory was called in the 40's had been suggested, but was not widely held. It has come to be accepted recently only because ^{of advances in technology} ⁽¹⁾considerably more data gathered by ^{more efficient} ~~better~~ telescopes, ⁽²⁾the rapid development of techniques of spectral analysis, and ⁽³⁾the building of high energy accelerators which allow scientists to simulate the conditions which are suspected to have existed at the time of the cosmos' birth. Scientists before 1950 did not have technology sufficient to gather enough data about the universe, ^{hence} ~~and~~ a number of theories were competing for acceptance. So while it would not be accurate to say that the author of the Urantia Book agrees with the science of the period as

far as the origin of the universe is concerned, it would not be inaccurate to say that there is no substantial disagreement. So it ^{is} ~~can~~ be seen that with regard to the three critical events considered in this paper the teachings of the Urantia Book do not substantially disagree with the teachings of science during the first half of the century. (It is of course also true that the agreement between the Urantia Book and science holds only for when, where, and how questions; there can be no agreement or disagreement on who and why questions because the physical sciences do not address themselves to these whereas the Urantia Book does.)

C. Analysis and Conclusion

I believe it would be appropriate for this paper to be terminated at this point. I have asked the question, "Which of the following statements is more likely to be true: (a) The Urantia Book is what it claims to be, or (b) The Urantia Book is the product of a human being(s) who lived in the first part of this century?" I have then shown through the presentation of some acceptable scientific evidence that the latter proposition has a higher degree of probability of being true than the former. And I could offer this conclusion as a presupposition for any study of the Urantia Book. However I am not at all content to draw such a conclusion. This discontent with the process I have followed comes from a number of realizations, all of which I will not discuss here, the most important of which is the realization that I have learned nothing new during this process. I confessed in the beginning that I suspected that the Urantia Book was a product of human creativity. But to be honest, this conclusion was much more a conviction than a suspicion. So in actuality I have done little more than confirm my own convictions. As a matter of

fact, and this is even more distressing, it seems to me that given my presuppositions and methodology I could not have accepted the Urantia Book's claims about itself even if the evidence supported such claims. Because it did not suit my purposes in ~~the body~~ of this paper, I neglected to mention the fact that there are points upon which today's science and the Urantia Book agree against the science of the 30's and 40's. For example, it was pointed out that current scientific knowledge and the Urantia Book both claim that the planet is about 4.5 billion years old. However during the 30's and 40's the best scientific estimates dated the origin of earth at about 3.5 billion years ago.¹¹ But could I use the fact that the Urantia Book is in this case, more accurate than the science of it's period as support for the proposition that the Urantia Book is telling the truth about itself? No I could not; there is too much evidence to the contrary; and I would have to suppose that the agreement here was merely an "unexplained coincidence." As a matter of fact, had it turned out to be the case that all the Urantia statements about the origin and evolution of physical world agreed with the theories of contemporary science, would I have thereby concluded that the Urantia Book is what it says it is? No I would not. I would have relegated this data to the category reserved for all miraculous events, viz. "unexplained coincidence" and would have proceeded to find another way to demonstrate the invalidity of the book's claims about itself. There is nothing in my background and training as an academician which has prepared me for the possibility that the claims which the Urantia Book makes about itself are true. Given the presuppositions of my scientific world view it is both unbelievable and inconceivable that a ten thousand page book could

suddenly appear in the world without being the product of human activity. The conclusions which have been drawn on this paper were, in a general way, determined before I began doing the research, for they were built into the presuppositions of the methodology.

Therefore, I suggest that rather than following a procedure similar to the one I have used that we consider the following:

1) That we adopt as a presupposition of our study the assumption that the Urantia Book is what it says it is. That is, that it represents a meta-system which contains an explanation for and understanding of the existence of this planet in general and human existence in particular. Given this presupposition, questions about the author or authors become incidental. For if this be the case we cannot come to understand the Urantia Book by learning about the human being(s) who delivered it to us. Rather we learn about human beings--the meaning, purpose, and value -- their existence by studying the Urantia Book.

2) That the questions we ask of the book arise not out of ourselves nor out of our particular academic disciplines, but rather that our questions arise out of a preliminary reading of the book. For example, earlier in this paper I asked the question, "When and by what means did the universe come into being?" To me that seems like an appropriate and important question. But as I consulted the Urantia Book it became clear that the question, asked in this way, was inappropriate. Immediately I discovered that the question can be answered only when I specify what I mean by "the" universe. For there are many universes. Hence the question needs to be more specific. I must ask "When and by what means did this universe come to be?" But on reading further I discovered that even this question is inappropriate. For even ^{though} the book contains general answers to these "When?" and "How?" questions, this information

is clearly incidental to the more intensive discussion of "Who?" and "Why?" questions. So if I allow my questions to arise out of the book, I would ask such things as "Who is Michael of Nebadon?", "Why did he organize this universe?", "What role did the Paradise Master Force Organizers play?", etc. Obviously these "Who" and "Why" questions are more appropriate to the Urantia Book.

3) That the method by which the answers are obtained and the logic system by which they are organized and evaluated arise out of the study of the book itself.

(A) For example, in this paper I have considered the truth of two apparently contradictory propositions and have proceeded on the assumption that both of them cannot be true. This procedure and assumption make good sense given my "scientific" methodology and "rational" logic system. However it is not necessary to assume that the Urantia Book would accept the validity of either my method of inquiry or my logic. Moreover it should not be assumed that my definition of such concepts as "causality," "substance," "time," "identity," etc. are applicable to the study. In order to understand and learn from this book, perhaps it will be necessary for me to master a different epistemology and a different system of logic and perhaps it will be necessary for me to accept the re-definition of certain key concepts. I am not at this point prepared to say just what methodological and logical structure(s), indeed if any, are contained in the book, for I have not yet read and studied enough. But my guess is that they differ radically from the method and logic used in constructing this paper.

In general I am suggesting that if we wish to learn anything significant from the Urantia Book we should let it speak to us--to instruct us in who and why it is, as well as what it is. I really don't know what we will hear if we learn to listen. But I suggest that in

this case we will learn more in listening to it than we will in speaking to it or in speaking to one another about it.

Alternate Conclusion

In conclusion I suggest that in studying the Uta Book we should, at least part of the time, follow the example of the Sufi master who looked for his key outside under the lamp rather than inside his house where he had lost them because, as he said, "This is where the light is." But in order to balance our method we must also, at least at times, be like the man who looked ~~at~~ ~~a~~ ~~sporting~~ ~~event~~ ~~1~~

through binoculars at a sporting event from a great distance. When a friend suggested he move closer to the action, he replied, "I like to look through these glasses and when I get too close I can't see very well."

Notes

1. Francis Crick, Life Itself: Its Origin and Nature (New York: Simon and Schuster, 1962).
2. Joseph Silk, The Big Bang (San Francisco: W. H. Freeman and Co., 1980), p. 278.
3. Ibid., pp. 284-292.
4. By "early moments" I mean as early as 10-38 records. For a readable account of these events see Joseph Silk, The Big Bang (San Francisco: W. H. Freeman & Company, 1980).
5. P. M. Hurley "Radioactivity and Time," Scientific American, Vol. 180-181, pp. 48-51. Hurley was a professor of geology at the Massachusetts Institute of Technology.
6. Scientific American, Vol. 181, pp. 48-51.
7. Scientific American, Vol. 167, p. 111.
8. Scientific American, Vol. 162, pp. 140f.
9. Silk, op. cit., p. 1.
10. Scientific American, Vol. 161, pp. 208f. In this article Russell does not mention Sir James Jeans' theory which was popular in the 20's and early 30's and which predicted that the universe was thousands of billions of years old, (Sir Hurley op. cit., p. 51).
11. Hurley, op.cit. p. 51.