Relativistic Expansion of the Universe, versus the Big Bang.

M. Singer
No affiliation
(singer43212@gmail.com)

***Abstract*-** This paper looks at Einstein's 1917 paper on the field equations for general relativity, in particular the equations' prediction that the Universe is expanding, made years before the Universe was actually found to be expanding. We examine the real-world consequences of these equations. Next, we look at the theory of the development of the "Big Bang" hypothesis as the origin of the expanding Universe. Finally, we compare the two theories with current measurement.

Keywords *Einstein, general relativity, Big Bang, expansion of the Universe*

I. INTRODUCTION

It is perhaps surprising that the predictions of Einstein's equations on general relativity have not been more thoroughly explored, and it is fair to say that the Universe they describe is neither well known nor well understood. These equations, as they describe the earlier Universe, are incompatible with the concept of the "Big Bang" and you have to choose one or the other – it is impossible for them both to be simultaneously correct.

II. EINSTEIN'S GENERAL RELATIVITY UNIVERSE

In 1917, at a time that everyone thought that the Universe was stable, Albert Einstein developed his equations on General Relativity, which showed clearly that an electromagnetic Universe such as ours must of necessity expand. Since the expansion of the Universe was not discovered till twelve years later, Einstein fudged the equations with a "Cosmological Constant" whose sole purpose was to stop the equations describing an expanding Universe. There was no logic behind this fudge, and after the discovery of the expanding Universe Einstein realized he had made a major error in proposing it. The basic equations, as they stand, describe an expanding Universe.

It is important to realize that in his equations all dimensions of spacetime are expanding. Not only space, but also time, so that time is dilating (slowing down) as space is dilating (expanding).

The Universe is – to our modern measurements – about 15 billion years old. The years are dilating, so taking our modern year as the reference, at half the age of the Universe (7.5 million years ago), taking our modern year as the reference, the year is only half as long. If we look back 14 billion years to a time the Universe is $1/15^{th}$ of its current age, the years would be $1/15^{th}$ the length of our current years.

Equally, spatial dimensions also shrink the further back in time we go. If we look back to a time when the Universe was $1/15^{th}$ the age it is now not only are the years $1/15^{th}$ the length of a modern year, but space is also $1/15^{th}$ of its modern length.

Now, look back to the viewpoint of an observer living at $1/15^{th}$ the current age of the Universe. What does he perceive? He perceives that he lives the same three score years and ten, and experiences the same passage of time as a modern person would in our modern world. He does not perceive the Universe as smaller than we do because all metrics such as the speed of light change in Universes of different dilations. Most importantly he sees the age of the Universe as being 15 billion of *his* years old. The Universe looks the same to him as it does to us.

Given that the Universe is expanding in time, a person living from some arbitrary time in the past all the way through to the present will perceive more years than we perceive he passed using our modern year as a metric. For example, from our point of view there are 7.5 billion of our years from half the age of the Universe till now. An observer 7.5 billion years in the past looking into the present time will perceive 15 billion of his shorter years are needed to get to the present. However, for someone actually living through those years the true age is in between those numbers – 10.6 billion years will pass.

As we travel further and further back in time the origin of the universe retreats in front of us so that it is always 15 billion years (local time) in the past. We can never reach the origin of the Universe because there isn't one. If we go back to year one of the Universe from our modern perception, where the year is 1/15-Billionth of our current year in length, then for someone living through the years from then to now 1,800 billion years of elapsed time will pass. Despite the amount of time we have gone into the past to become the local observer living at that past time, the Universe still appears to be 15 billion local years old.

Likewise, the visible Universe always remains the same perceived size to a local observer – measurements such as the speed of light, the size of atoms, and every metric in the Universe, change as the Universe dilates. The infinite Universe shrinks to a smaller but still infinite size the further back in time we go.

The expansion of the Universe is progressive. It will never stop because it is an intrinsic property of our electromagnetic Universe. It will be double its present size in another 15 billion of our years, at which time our current time will appear to be 7.5 billion years in the past. At all stages the Universe looks to the

local observer just as it does now, an energy conserving 15-billion-year-old Universe.

There are obvious consequences of this. In particular, the Universe is of infinite age in terms of living through and counting the years. This leads to possibilities, such as the one that our galaxy may be much older than supposed, and contains many old and dead stars that are too dark to be visible, but that still add to the mass and the dark matter in the galaxy.

III. The "Big Bang" Universe

The concept of the "Big Bang" dates from George Lemaitre, who in 1931, after Hubble's discovery that the Universe was indeed expanding, proposed that all matter in the Universe started out at one point in space and exploded – a Cosmic Egg. Thus, in this theory spacetime is not required to be expanding as it is in Einstein's theory. Rather, it is stable, but the explosion of that Cosmic Egg is blasting fragments of matter out into space in an ever-expanding cloud of debris. The Universe, originally empty, is forming galaxies and stars out of the debris.

This theory was later reworked so that all the matter and energy in the Universe was not required to be stored in that cosmic egg. Instead it is now proposed that the early Universe had very different properties to our modern Universe. It is proposed that it was not energy-conserving as our modern Universe is, and in such a Universe mass and energy could be created out of nothing.

The cosmic egg was replaced with a seed mass of some form that appears randomly in space out of nowhere. The non-energy-conserving nature of the Universe at that time caused this to rapidly expand into more mass and energy, boiling out of nowhere in a cataclysmic explosion that created all the mass and energy in the current Universe. At some point the Universe changed from being non-energy-conserving into energy-conserving and the creation of new mass/energy came to a halt. The energy of the explosion however continued to blast debris out into the empty Universe, where it formed galaxies and stars. There remain questions how that first seed mass formed and why the Universe changed its nature so completely to an energy-conserving form.

Neither space nor time are expanding in this Universe. It is only the cloud of debris created by the explosion at the beginning of time that is expanding through space. Since the explosive energy disappeared when the Universe evolved to its present energy-conserving state, the gravitational pull of all that mass must now be slowing down the rate of expansion.

IV. The Evidence

In 1998 two separate projects – The Supernova Cosmology Project and The High-Z Supernova Research Team – examined distant type 1a supernovae which have a near-standard intrinsic brightness, so that their brightness as seen from Earth can be used to measure their distance from us. By measuring the red shift and comparing it with that distance we can measure how the Universe expands over time. The results clearly show that the rate of expansion is increasing, which means that if the redshift is caused by a "Big Bang" explosion, that explosion must still be continuing. In other words, we should be living in a Universe in which mass/energy is not conserved but is still being created out of nothing. All the available evidence contradicts this, and as the current increase in expansion of the Universe clearly does not require an explosive source now, there is no requirement to have had an explosive event in the past. In other words, no Big Bang. Work is going on to resolve the discrepancy but there is no clear insight into it.

On the other hand, Einstein's expanding Universe clearly demands a progressive expansion, expanding faster and faster as we move into the future. The increasing rate of expansion of the Universe matches Einstein's equations on general relativity.

V. Conclusion

In the "Big Bang" Universe, neither space nor time are expanding, contrary to Einstein's general relativity equations. Hence both theories cannot be simultaneously correct. We must choose one or the other, or perhaps neither, but not both.

The measurements showing that the rate of expansion of the Universe is increasing, would seem to refute the theory of the "Big Bang", and support General Relativity.

One last word. No theory surrounding the origins or the nature of the Universe can be truly scientific. The scientific method requires us to prove our theories in the laboratory, then pass the methods to others for them to verify it in their laboratories. Since we cannot create laboratory Universes to test our hypotheses, no matter how certain we are of our own particular theory of its origins, we can never prove it. All theories on the origins of the Universe must remain speculative.