Untitled Essay, Research Paper

It is always a mystery about how the universe began, whether if and when it will end. Astronomers construct hypotheses called cosmological models that try to find the answer. There are two types of models: Big Bang and Steady State. However, through many observational evidences, the Big Bang theory can best explain the creation of the universe. The Big Bang model postulates that about 15 to 20 billion years ago, the universe violently exploded into being, in an event called the Big Bang. Before the Big Bang, all of the matter and radiation of our present universe were packed together in the primeval fireball–an extremely hot dense state from which the universe rapidly expanded.1 The Big Bang was the start of time and space. The matter and radiation of that early stage rapidly expanded and cooled. Several million years later, it condensed into galaxies. The universe has continued to expand, and the galaxies have continued moving away from each other ever since. Today the universe is still expanding, as astronomers have observed. The Steady State model says that the universe does not evolve or change in time. There was no beginning in the past, nor will there be change in the future. This model assumes the perfect cosmological principle. This principle says that the universe is the same everywhere on the large scale, at all times.2 It maintains the same average density of matter forever. There are observational evidences found that can prove the Big Bang model is more reasonable than the Steady State model. First, the redshifts of distant galaxies. Redshift is a Doppler effect which states that if a galaxy is moving away, the spectral line of that galaxy observed will have a shift to the red end. The faster the galaxy moves, the more shift it has. If the galaxy is moving closer, the spectral line will show a blue shift. If the galaxy is not moving, there is no shift at all. However, as astronomers observed, the more distance a galaxy is located from Earth, the more redshift it shows on the spectrum. This means the further a galaxy is, the faster it moves. Therefore, the universe is expanding, and the Big Bang model seems more reasonable than the Steady State model. The second observational evidence is the radiation produced by the Big Bang. The Big Bang model predicts that the universe should still be filled with a small remnant of radiation left over from the original violent explosion of the primeval fireball in the past. The primeval fireball would have sent strong shortwave radiation in all directions into space. In time, that radiation would spread out, cool, and fill the expanding universe uniformly. By now it would strike Earth as microwave radiation. In 1965 physicists Arno Penzias and Robert Wilson detected microwave radiation coming equally from all directions in the sky, day and night, all year.3 And so it appears that astronomers have detected the fireball radiation that was produced by the Big Bang. This casts serious doubt on the Steady State model. The Steady State could not explain the existence of this radiation, so the model cannot best explain the beginning of the universe. Since the Big Bang model is the better model, the existence and the future of the universe can also be explained. Around 15 to 20 billion years ago, time began. The points that were to become the universe exploded in the primeval fireball called the Big Bang. The exact nature of this explosion may never be known. However, recent theoretical breakthroughs, based on the principles of quantum theory, have suggested that space, and the matter within it, masks an infinitesimal realm of utter chaos, where events happen randomly, in a state called quantum weirdness.4 Before the universe began, this chaos was all there was. At some time, a portion of this randomness happened to form a bubble, with a temperature in excess of 10 to the power of 34 degrees Kelvin. Being that hot, naturally it expanded. For an extremely brief and short period, billionths of billionths of a second, it inflated. At the end of the period of inflation, the universe may have a diameter of a few centimetres. The temperature had cooled enough for particles of matter and antimatter to form, and they instantly destroy each other, producing fire and a thin haze of matter-apparently because slightly more matter than antimatter was formed.5 The fireball, and the smoke of its burning, was the universe at an age of trillionth of a second. The temperature of the expanding fireball dropped rapidly, cooling to a few billion degrees in few minutes. Matter continued to condense out of energy, first protons and neutrons, then electrons, and finally neutrinos. After about an hour, the temperature had dropped below a billion degrees, and protons and neutrons combined and formed hydrogen, deuterium, helium. In a billion years, this cloud of energy, atoms, and neutrinos had cooled enough for galaxies to form. The expanding cloud cooled still further until today, its temperature is a couple of degrees above absolute zero. In the future, the universe may end up in two possible situations. From the initial Big Bang, the universe attained a speed of expansion. If that speed is greater than the universe’s own escape velocity, then the universe will not stop its expansion. Such a universe is said to be open. If the velocity of expansion is slower than the escape velocity, the universe will eventually reach the limit of its outward thrust, just like a ball thrown in the air comes to the top of its arc, slows, stops, and starts to fall. The crash of the long fall may be the Big Bang to the beginning of another universe, as the fireball formed at the end of the contraction leaps outward in another great expansion.6 Such a universe is said to be closed, and pulsating. If the universe has achieved escape velocity, it will continue to expand forever. The stars will redden and die, the universe will be like a limitless empty haze, expanding infinitely into the darkness. This space will become even emptier, as the fundamental particles of matter age, and decay through time. As the years stretch on into infinity, nothing will remain. A few primitive atoms such as positrons and electrons will be orbiting each other at distances of hundreds of astronomical units.7 These particles will spiral slowly toward each other until touching, and they will vanish in the last flash of light. After all, the Big Bang model is only an assumption. No one knows for sure that exactly how the universe began and how it will end. However, the Big Bang model is the most logical and reasonable theory to explain the universe in modern science. ENDNOTES 1. Dinah L. Mache, Astronomy, New York: John Wiley & Sons, Inc., 1987. p. 128. 2. Ibid., p. 130. 3. Joseph Silk, The Big Bang, New York: W.H. Freeman and Company, 1989. p. 60. 4. Terry Holt, The Universe Next Door, New York: Charles Scribner’s Sons, 1985. p. 326. 5. Ibid., p. 327. 6. Charles J. Caes, Cosmology, The Search For The Order Of The Universe, USA: Tab Books Inc., 1986. p. 72. 7. John Gribbin, In Search Of The Big Bang, New York: Bantam Books, 1986. p. 273. BIBLIOGRAPHY Boslough, John. Stephen Hawking’s Universe. New York: Cambridge University Press, 1980. Caes, J. Charles. Cosmology, The Search For The Order Of The Universe. USA: Tab Books Inc., 1986. Gribbin, John. In Search Of The Big Bang. New York: Bantam Books, 1986. Holt, Terry. The Universe Next Door. New York: Charles Scribner’s Sons, 1985. Kaufmann, J. William III. Astronomy: The Structure Of The Universe. New York: Macmillan Publishing Co., Inc., 1977. Mache, L. Dinah. Astronomy. New York: John Wiley & Sons, Inc., 1987. Silk, Joseph. The Big Bang. New York: W.H. Freeman and Company, 1989. ——————————————————————————