Bigbang3(A) Essay, Research Paper

It is always a mystery about how the universe began, whetherif and when it will end. Astronomers construct hypotheses calledcosmological models that try to find the answer. There are twotypes of models: Big Bang and Steady State. However, throughmany observational evidences, the Big Bang theory can bestexplain the creation of the universe. The Big Bang model postulates that about 15 to 20 billionyears ago, the universe violently exploded into being, in anevent called the Big Bang. Before the Big Bang, all of thematter and radiation of our present universe were packed togetherin the primeval fireball–an extremely hot dense state from whichthe universe rapidly expanded.1 The Big Bang was the start oftime and space. The matter and radiation of that early stagerapidly expanded and cooled. Several million years later, itcondensed into galaxies. The universe has continued to expand,and the galaxies have continued moving away from each other eversince. Today the universe is still expanding, as astronomershave observed. The Steady State model says that the universe does notevolve or change in time. There was no beginning in the past,nor will there be change in the future. This model assumes theperfect cosmological principle. This principle says that theuniverse is the same everywhere on the large scale, at alltimes.2 It maintains the same average density of matter forever. There are observational evidences found that can prove theBig Bang model is more reasonable than the Steady State model. First, the redshifts of distant galaxies. Redshift is a Dopplereffect which states that if a galaxy is moving away, the spectralline of that galaxy observed will have a shift to the red end. The faster the galaxy moves, the more shift it has. If thegalaxy is moving closer, the spectral line will show a blueshift. If the galaxy is not moving, there is no shift at all. However, as astronomers observed, the more distance a galaxy islocated 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 modelseems more reasonable than the Steady State model. The second observational evidence is the radiation producedby the Big Bang. The Big Bang model predicts that the universeshould still be filled with a small remnant of radiation leftover from the original violent explosion of the primeval fireballin the past. The primeval fireball would have sent strongshortwave radiation in all directions into space. In time, thatradiation would spread out, cool, and fill the expanding universeuniformly. By now it would strike Earth as microwave radiation. In 1965 physicists Arno Penzias and Robert Wilson detectedmicrowave radiation coming equally from all directions in thesky, day and night, all year.3 And so it appears thatastronomers have detected the fireball radiation that wasproduced by the Big Bang. This casts serious doubt on the SteadyState model. The Steady State could not explain the existence ofthis radiation, so the model cannot best explain the beginning ofthe universe. Since the Big Bang model is the better model, the existenceand the future of the universe can also be explained. Around 15to 20 billion years ago, time began. The points that were tobecome the universe exploded in the primeval fireball called theBig Bang. The exact nature of this explosion may never be known. However, recent theoretical breakthroughs, based on theprinciples of quantum theory, have suggested that space, and thematter within it, masks an infinitesimal realm of utter chaos,where events happen randomly, in a state called quantumweirdness.4 Before the universe began, this chaos was all there was. Atsome time, a portion of this randomness happened to form abubble, with a temperature in excess of 10 to the power of 34

degrees Kelvin. Being that hot, naturally it expanded. For anextremely brief and short period, billionths of billionths of asecond, it inflated. At the end of the period of inflation, theuniverse may have a diameter of a few centimetres. Thetemperature had cooled enough for particles of matter andantimatter to form, and they instantly destroy each other,producing fire and a thin haze of matter-apparently becauseslightly more matter than antimatter was formed.5 The fireball,and the smoke of its burning, was the universe at an age oftrillionth of a second. The temperature of the expanding fireball dropped rapidly,cooling to a few billion degrees in few minutes. Mattercontinued to condense out of energy, first protons and neutrons,then electrons, and finally neutrinos. After about an hour, thetemperature had dropped below a billion degrees, and protons andneutrons combined and formed hydrogen, deuterium, helium. In abillion years, this cloud of energy, atoms, and neutrinos hadcooled enough for galaxies to form. The expanding cloud cooledstill further until today, its temperature is a couple of degreesabove absolute zero. In the future, the universe may end up in two possiblesituations. From the initial Big Bang, the universe attained aspeed of expansion. If that speed is greater than the universe’sown escape velocity, then the universe will not stop itsexpansion. Such a universe is said to be open. If the velocityof expansion is slower than the escape velocity, the universewill eventually reach the limit of its outward thrust, just likea 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 theBig Bang to the beginning of another universe, as the fireballformed at the end of the contraction leaps outward in anothergreat expansion.6 Such a universe is said to be closed, andpulsating. If the universe has achieved escape velocity, it willcontinue to expand forever. The stars will redden and die, theuniverse will be like a limitless empty haze, expandinginfinitely into the darkness. This space will become evenemptier, as the fundamental particles of matter age, and decaythrough time. As the years stretch on into infinity, nothingwill remain. A few primitive atoms such as positrons andelectrons will be orbiting each other at distances of hundreds ofastronomical units.7 These particles will spiral slowly towardeach other until touching, and they will vanish in the last flashof light. After all, the Big Bang model is only an assumption. No one knows for sure that exactly how the universe began and howit will end. However, the Big Bang model is the most logical andreasonable 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: CharlesScribner’s Sons, 1985. p. 326. 5. Ibid., p. 327. 6. Charles J. Caes, Cosmology, The Search For The Order OfThe Universe, USA: Tab Books Inc., 1986. p. 72. 7. John Gribbin, In Search Of The Big Bang, New York: BantamBooks, 1986. p. 273. BIBLIOGRAPHYBoslough, 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.——————————————————————————