

Cosmology research paper examples

[Technology](#), [Future](#)



Abstract

Since time immemorial man has tried to study the Universe, its origin, and the laws that govern it. For many centuries now, this has been the major attraction in the field of Science. The scientific curiosity to learn about the Universe and its origin has gradually developed into a well defined branch of Science termed Cosmology. Today there are many sub-branches in Cosmology, and man has made huge progress in the journey towards finding the ultimate truth about the Universe. This paper introduces the field of Cosmology, its various disciplines, past findings, and then goes on to outline the present research and future prospects in this field.

Introduction

Cosmology can be crudely defined as the study of the Universe. It analyses the history of the Universe - its origin and evolution, and uses it to predict its ultimate future. Physical Cosmology deals with the scientific and scholarly study of the dynamics and structure of the Universe, and theorizes about its origin, evolution and future course ("Cosmology" - Wikipedia, 2013).

Physical Cosmology is related to various branches of study including metaphysics, astrophysics, quantum mechanics, particle physics, plasma physics, religious cosmology, etc.

The broad areas of study in the field of Physical Cosmology are: very early Universe, cosmic microwave background, Big Bang nucleosynthesis, large scale structures - formation and evolution, dark energy, and dark matter ("Physical Cosmology" - Wikipedia, 2013). In the history of Cosmology, there were two major theories to explain the present state of the Universe: the

Steady State Theory, and the Big Bang Theory.

Steady State Theory: This stated that the Universe is more or less a constant at every point in time. According to this theory, new matter is created when galaxies and celestial bodies move away from one another. This concept was pioneered by the English astronomer Sir Fred Hoyle. Though this theory was well supported by the scientific community for a long period, the later experimental results and evidence pointed towards the Big Bang theory being more plausible.

The Big Bang Theory: This model is the foundation for all research in the field of Cosmology today. According to this model, the Universe was initially in a hot dense state. From that point, the Universe has been expanding continuously, and evolving with time. The cosmic microwave background supported this model strongly, which gave it the upper hand against the steady state theory ("WMAP's Introduction", 2013). Since then, there have been numerous results from scientific experiments which support the validity of this theory. A picture of the cosmic microwave background (Figure 1) and its spectral response (Figure 2) are shown below.

Figure 1: Cosmic Microwave Background

Figure 2: Spectral response of the Cosmic Microwave Background

Present Research and Future Prospects:

Some of the latest observations in Cosmology and what they offer for the future are given below:

- Neutrino shape-shift: A detector in Japan has observed for the first time neutrinos that are capable of morphing between their two out of three flavors. This offers new dimensions to the study of interactions between

matter and anti-matter.

- Camera to detect dark light: Chile has fitted one of its telescopes with a camera which can detect light that has been stretched to higher wavelengths by dark energy. A picture of the camera is shown in (Figure 3).

Figure 3: Camera that detects dark light

- Cosmic Collisions: Two neutron stars that collided were observed to have spat a huge amount of gold. This may lead to the explanations of how the Earth got its supply of the coveted metal (“Cosmology – New Scientist”, 2013).

Summary:

The Universe is changing continuously – evolving with time. The discovery of the cosmic microwave background has justified this model. The field of Cosmology has developed to a great extent. Today observations made in various sub-branches of the field, have led to mind blowing theories and explanations about the nature of the Universe. With the advancements in technology, it is expected that cosmological experiments will yield better and quicker results in the future.

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