Eyes Wide Shut

Big Bang Theorists Out of Orbit

By J V NARLIKAR

"Cosmologists are always wrong but never in doubt", Lev Landau, a distinguished theoretical physicist once said. Max Born, one of the early pioneers of quantum physics said: "...modern cosmology has strayed from the sound empirical road into a wilderness where statements can be made without fear of observational check..."

The statements were made not in modern times but a few decades ago. I wonder what these worthies would have thought of cosmology, had they been around today. As one who spent nearly four decades of his research career in cosmology, I am sometimes asked by laymen, as to why I do not subscribe to the Big Bang theory of the origin of the universe. I do not subscribe to the Big Bang theory, because today it is no longer controlled by the rather demanding rules of science: it has become an article of faith for its followers.

Science has progressed thus far because it adheres to a discipline. Its theories must make testable predictions, predictions that in principle can be disproved. Thus to say that when I toss a coin it will fall either heads up or tails up is no prediction. Moreover, the theories must be tested by repeatable experiments. Thus a theory that explained a phenomenon which occurred only once is not credible. Finally, the Sherlock Holmes maxim that when you have eliminated the impossible, whatever remains, however improbable must be the truth, applies only if you really tried to eliminate the alternatives before claiming your theory as the truth.

Wave Theory

No laboratory scientist will contest these requirements as essential guidelines for scientific progress. A glance at the history of science will bear out this fact. Experiments which worked in one man's lab only and could not be repeated by others ceased to be credible. A classic example was the claim for the existence of N-rays akin to X-rays. Prejudice in favour of the corpuscular theory of light from no less a person than Isaac Newton, led to the delay in acceptance of the wave theory of light.

In astronomy too, these requirements are adhered to in general, despite the limitations astronomers have to face, namely that they cannot control the cosmos that they set out to observe. Moreover, they have to extrapolate the laws of science determined within the laboratory walls to the much more vast and varied cosmic environment. The study of planetary motion as per the law of gravitation has followed this straight and narrow path of science; and it has also gained from it. The planet Neptune was discovered as a result of investigations into an apparent anomaly in the motion of planet Uranus. Why did Uranus depart from its predicted Newtonian orbit? Were there observations in error? No. So, was the Newtonian law wrong? Before arriving at this last resort, there existed a third option, namely the existence of an as yet unknown object in the vicinity of Uranus, whose gravitational pull was disturbing its orbit. That was Neptune, the new planet.

Looking Back

I have given this example to show that astronomy does adhere to the scientific method. Other instances can be cited. The theory of why stars shine and how they evolve is a success story of the twentieth century astronomy. When explaining why the Sun shines, theoreticians not only explain the power of Sun's radiation and its surface temperature in terms of its mass, they also predict the results for several other stars of different masses, and the theory checks out. Moreover, while studying the stellar energy problem astrophysicists could tell a thing or two to their laboratory counterparts, about how nuclear fusion takes place. It is against this background that one must examine the subject of cosmology.

In 1929, observations by Edwin Hubble provided the first factual foundation to cosmological theories. Interpreted at face value, they suggested that the universe is expanding, that all its galaxies are moving away from one another. Theoretical inputs added to this fact lead to simple models of the expanding universe in which the universe was supposed to have begun in a gigantic primeval explosion about ten billion years ago.

This is the so-called Big Bang model and it received a big boost in the mid-1960s when the universe was found to have an all-pervading uniform background of radiation in the microwaves. The background is believed to be a relic of the hot era that existed in the early moments of the universe. This had been predicted in 1948, and its detection and further studies, therefore, provided a confirmation of the entire scenario.

Until the 1970s, cosmologists were attempting to probe the universe to as far a distance as possible, since by looking far they were in fact catching glimpses of how the universe looked in the past. Astronomical telescopes have dramatically improved both in quality and versatility, thanks to new technologies. This has opened out new vistas of the universe that were considered beyond human observing ability only a couple of decades back. However, can we look far enough to see the Big Bang itself?

Unfortunately not, and ironically because of another prediction of the Big Bang theory itself. As we look back to more and more distant objects, we encounter a background of increasing temperature, till we hit an opaque fog-like curtain beyond which we cannot see. Big Bang calculations show that this happened when the universe was a few hundred thousand years old.

Most of the work on the Big Bang theory today is based on the study of the early moments when the universe was no more than a billion-billion-billion-billionth part of a second old. As we just saw, there is no hope of observing the universe in that state. The physics used for the study is also highly speculative, since it deals with particles of such high energy that no one has observed let alone experimented with particles of such high energy in the laboratory.

Untested Physics

In short, the Big Bang theory applies untested physics to a part of the universe that it is impossible to see and talks about events that would never be repeated. Surely, these limitations are of a fundamental nature and call for a more open attitude towards cosmology. Thus a scientific attitude requires the admission that the issue about the origin of the universe is still wide open.

Yet if you listen to the Big Bang theorists they are dead certain, this is the way it all happened; so certain, that they are unwilling to consider any alternative ideas.

To me it does not sound like science. Which is why I don't believe it.