INVESTIGATING THE UNIVERSE

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A quick glance at the universe

Our relatively advanced knowledge of the universe in which we live began with the theory of the expanding universe propounded by Hubble in 1929. As we know today, the universe consists of well over a hundred billion enormous star clusters known as galaxies. The galaxy to which our solar system belongs is labelled the *Milky Way*. It consists of between a 100 and 104 billion stars of different character arranged in a spiral formation, as a result of which we refer to our galaxy as a spiral galaxy. There are other galaxies as well, notably *Andromeda* which is closest to our galaxy, and is also spiral in structure, besides containing roughly a similar number of stars. There are also galaxies other than spiral ones, such as elliptical galaxies, and others which are beyond the author's knowledge. All in all, according to current astronomical studies, there are almost another 100 billion galaxies existing in outer space. The universe indeed is enormous and far beyond our present comprehension.

After certain observations made in the US by Slipher that the galaxies appeared to be moving from one another, in 1929 Hubble established by spectroscopic studies based on what is known as the Doppler Effect, that the galaxies were indeed moving away from us. The rate of recession appeared to be proportional to the distance of the galaxy from us. As a result, the further the galaxy was from the point of observation, the greater was its velocity of recession. Such an observation would have been made, in fact, from any point in the universe and not merely from our Earth which in the 16th century and before, was considered to be the centre of the universe. But a further conclusion that arises from the theory of the expanding universe is that aeons and aeons ago all the matters and energy in the universe would have been concentrated into a single point referred to as a *singularity*. It is believed today that 13.7 billion years ago, this singularity underwent as what is now referred to as the *Big Bang,* which spewed forth in all directions energy and matter which ultimately created the elements, and in a matter of minutes, created the myriad stars that today make up our firmament. But it is not my intention to write here of the Big Bang, which we might reserve for a future occasion. Apart from the myriad stars distributed throughout the universe in the form of galaxies, it had also been discovered that in inter-galactic space and perhaps within the galaxies themselves, there exists an enormous continuance of what is known as *Dark Matter* consisting of extremely minute particles which have velocities of their own. In popular terms this mass of Dark Matter may be referred to as *Star dust.*

Some insights into our universe

Apart from satellites that revolve in outer space around our Earth, fulfilling such purposes as observing cloud systems around the Earth from hundreds of miles beyond and thus helping to predict the Earth's weather, such satellites are vital in establishing communications around our globe. In fact, but for these satellites, radio and television from one part of our earth could never be received on the opposite side, as is common today. The physics and mathematics of the communications satellites were first described in the 1945 edition of the journal *Wireless World* by Arthur C. Clark, who honours our little island today by having made it his home. But humankind has also sent unmanned satellites to planets such as Mars and Venus for collection of data regarding the surface features of these planets. This data has been relayed to space centers such as NASA which have acquired considerable information about the atmospheres and small segments of the surfaces of these planets. But man has also successfully sent a manned satellite to our moon. Data from the intrepid astronauts who made the journey such as Neil Armstrong, Edwin Aldrin and Michael Collins have given us greater insight into the surface of the moon.

Many years ago, on the initiative of Berkeley, NASA dispatched a historic spacecraft named *Star Dust* to the outer reaches of space. This unmanned craft traveled a distance of 4 trillion miles and has only recently returned safely to Earth. The journey to outer space took nearly seven years. It collected materials from the tail of a distant comet mostly particle in nature as well as samples of star dust from outside in what was long ago thought to be empty space. *Star Dust* has safely brought back the samples it collected. As I write these lines, scientists and astronomers both in the

USA and other parts of the world are excitedly looking forward to the samples brought back by '*Star Dust*'. NASA, in fact apart from its own investigations, has also opened a new website calling upon the interested public to observe the magnified images of the particles returned to earth, and their observations regarding densities and other features. Of course, before projecting these pictures on the website, NASA will magnify them considerably for observational purposes. Up to today, the public response has been enormous.

So called star dust normally bombards the Earth and even our own rooftops at the rate of about 100,000 per square inch. But, as far as we know, they are harmless and beyond any perception by ordinary human beings. Even with these complex arrangements and attempts, NASA estimates that it may take at least a further year or two before we reach any understanding of the Dark Matter that fills our universe.

Space, I repeat again, is indeed vast, and even the few steps taken by a puny race on a medium planet such as Earth has yielded information that bogs the imagination. In this brief article I have merely touched upon some of the fringes of our knowledge regarding the universe. Unfortunately, astronomy is a closed book to 99% or more of the residents of earth. In Sri Lanka it is not even a viable subject in courses leading to the O-Level and the A-Level examinations. Only a few–indeed a very few – amateurs devote any interest to the amazing universe in which we humans live. If time and space permits, the author hopes in future issues of *Polity* to bring to the notice of its readers certain other features of the vast universe.

I finally hope that, as in many countries, astronomy will before long become a subject with observational facilities in our schools and, above all, in the universities of Sri Lanka. ■

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