THE CONTOUR ISSN 2349-6398
An International Peer-reviewed Online Journal of Studies in English

Creative Writing

LOOKING AT TIMES JUST AFTER CREATION….

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Abstract

We narrate an interesting story of the event of creation. We try to put forward the basic story for the non-expert in a rather chatty style trying to keep the scientific essence unperturbed without going into any formal rigor.

Just a look "above"

Have you gazed at the sky overhead on a moon-less night, at a location not too lighted by the electric lamps of the city? You must have, at least once in your lifetime. There seems to be thousands if not millions of lighted spots of varying size and intensity. They are supposedly heavenly bodies and in reality gigantic objects, mostly stars (with a handful of planets and our one and only moon) thousands of miles maybe several hundreds of light years away from our planet earth. As the physicists say these stars are all receding from each other at a considerable speed. Each receding from every other one. Now what does that mean? It must mean that at some point of time in some remote past all these 'biggies' were all together at a point. Thereafter, there ought to have been a enormous explosion due to which they all have been set to this 'fleeing motion'. This must have been the birth of our universe. This is what cosmologists term as 'Big Bang'.

Looking around here on earth

Let us now look around here on earth. If we look around, we see many bodies attracting or repulsing each other. That is due to the existence of natural forces. There are essentially four types of natural forces. Of these, we shall be discussing the first three. The fourth is beyond the scope of the present article.

Suppose you throw a stone upwards. It rises to a point and then falls back. Let us consider a second situation. Suppose you take two magnets. Sometime they attract each other when opposite poles are face to face while there are times when like poles face each other and they repel. The same story goes for electric charges as well. There too, unlike charges attract and like charges repel. The first kind of

attraction is called Gravitation by which we mean an attractive force that acts between any two bodies having some nonzero mass. This is the force responsible for the tides. The second kind of force is termed as Electromagnetic force that can be both attractive and repulsive in nature. This is responsible for the forces between magnets, electric charges etc.

To talk about the third force we need to see what matter is made of. As scientists say the smallest bit of any material capable of independent existence that holds all the properties of that material is termed as a molecule of that material. Each of these molecules is consisted of a number of smaller and more fundamental parts called the atom. Each atom is characteristic of the concerned element. Needless to say that these atoms have properties of their own and the properties of the original molecule no longer exists. This of course holds good for molecules of compounds by which we mean that in the concerned molecule, atoms of more than one type is present. For instance a water molecule consists of two hydrogen atoms and one oxygen atom. Clearly the properties of hydrogen and oxygen vary entirely from that of water. This kind of story is of course valid only for molecules of compounds. For molecules of the elements, breaking up a molecule will yield nothing newer. These constituent atoms are not fundamental in structure. They comprise of three types of minute particles: the positively charged proton, the electrically neutral neutron and the negatively charged electron. The atom has a structure like our Solar system. As the Sun is in the centre of the solar system, here the protons and neutrons club together to form a central nucleus. Just as the planets revolve around the sun, here the electrons revolve around the central mass.

Structurally all seems okay. But a little thinking would provoke a thought. Protons all being positively charged shouldn't they repel each other? Then, how can an atom be stable? Would it not disintegrate? It does not, thanks to a much stronger attractive force between sub nuclear particles called the Strong force, which is our third kind of natural force. This force is a key in the story of creation that we are out to narrate.

Now are these protons and neutrons fundamental? Until couple of decades back, they were considered so. Then some experiments revealed that they were consisted of tiny point masses called quarks, three of which add up to make a proton or a neutron. There also is a second kind of particle that is called the anti quark that does not exist in protons or neutrons, but does so in particles like anti-protons, mesons etc. At this point let us refer to a game we all are familiar with, namely "Tug-of-war". In this game two groups of people pull i.e. apply attractive force on each other through a large rope. The rope is the medium through which the two groups of people interact with each other. The story is somewhat similar here too. These quarks and anti quarks interact among them by a mediator called gluon. But detailed discussions on these are not required presently.

The Energy Conversion Picture and QGP

We know in science that energy cannot be created or destroyed; it can only change its form from one to another. Say, for instance, if we clap our hands the kinetic energy of our hands is transferred into sound energy and some heat energy.

Now, a medium, typically air is required for sound to propagate. If by some means we could clap in vacuum then the whole kinetic energy would be transformed into heat thereby making the release of heat much more which manifests as a higher temperature. This is utilized in the so called relativistic heavy ion colliders. This seems to be an awfully hard term to comprehend. Let us try to clear the mist. Suppose we are throwing stones of varying sizes at a glass wall all along the same line (or parallel to each other). We further assume that each stone is thrown at the same speed. We shall see that the heavier the stone is, the larger the impact is on the wall. This is due to something called momentum. Momentum is defined as mass times velocity. Mass means the amount of substance in it typically measured in grams or k.g. Velocity means the speed in a particular direction. Now, we know that light travels at a tremendous speed of three hundred thousand kilometers per second. Speeds comparable to this are termed as relativistic. When one or more electrons are stripped off any atom we get a positively charged ion. These ions experience attractive forces when placed in an electromagnetic field, by which we mean either an electric field or a magnetic field or a combination of both. Thus using applied electromagnetic fields and accelerating heavy ions (large momentum due to heavy mass) they are made to collide at relativistic speeds at these relativistic heavy ion colliders. This collision is done in an evacuated chamber. The resulting temperature is enormous. In Centigrade scale say, eleven zeroes after unity! At this huge temperature something very interesting happens as we shall see shortly.

Suppose we have a bag within which we have several ping pong balls that incessantly move within the bag continuously bouncing against each other without the loss of any energy and with the walls of the bag. The particles like protons and neutrons are assumed to be like bags within which the quarks and gluons are confined. At the tremendously high temperature after the collision of the heavy ion beams the walls of the constituent protons and neutrons break loose and the quarks move out of the particle volume to a much larger volume.

So what do we get after the relativistic heavy ion collisions? We get a new state of matter, a state of quark de-confined matter which we term as a Quark Gluon Plasma or in short QGP.

QGP & the Early Universe

Cosmologists say that micro seconds after the Big Bang (a micro second is one millionth of a second) the universe was tremendously hot and in a state of QGP. Then as time evolved, it evolved and matter as we see today were born. Thus it is proposed that if we can create a state of QGP and study the time evolution thereof then we might unravel the secrets of creation. It might be something like travelling in a time machine. As if we are sitting in our modern day laboratory and seeing an event which had occurred just after the moment of creation.

Conclusion

The story thus far is a very long and complicated story narrated simplistically and in a rather truncated way. The world today consists nor of bare quarks, anti quark and gluons neither of bare protons and neutrons. So, there remain a whole lot of complicated processes that needs to be deliberated upon. But unfortunately, that is too complicated a story to narrate casually. Nevertheless, let us try to just touch upon very briefly. The QGP formed is expected to be extremely hot and under a tremendous pressure. So needless to say it would try to expand. As it expands it shall cool. At a much lower temperature the quarks, anti quarks and gluons will recombine to form particles that we would be able to detect in our laboratory. This is what might have happened at the wee hours after creation. But as we mentioned that story is beyond the scope of the present text. The interested reader may be referred to texts elsewhere.