Editorial

Our efforts to get JIGU included in reputed international citation index channels have yielded positive results. Some structuring issues will be resolved by December and articles published in our journal will be included in the citation index administered by DOAJ. NISCAIR accreditation continues.

Higher Education in earth sciences—need for new initiatives

I urge the teachers and guides to always keep in view that education is unquestionably a unique and powerful lever for change in society. And as such, if committed, they can significantly mould our young in to a strong guiding force. We should never forget that knowledge acquired through well articulated technical education coupled with wisdom, gained through positive interaction with elders and learned, can play an important role as far as sustainable development is concerned; a vital force to help our country wade through various turbulent impediments. Science—as done by professional scientists—involves curiosity, hypothesis forming, experimentation, data analysis, and the thrill of discovery. However, you might never learn this in a traditional classroom, where teachers often present scientific subjects as sets of facts to be memorized rather than as perpetually evolving fields of active inquiry. Giving 'students' (of all ages) the knowledge, values and critical thinking abilities to interpret and address the environmental and social issues that will be driving business decisions in the years to come should be a high priority, of our education (starting from Primary school education to University).Since environmental and social issues are involved earth science education can set-right various blemishes arising out of our way of living, at the expense of our own health and that of other creatures. One of the deficiencies noticed in our higher education system is non exposure of young researchers and post graduate students to international learning environment. We need to provide Wings to Talent to address the need for human resource development and capacity building in science and technology. Our university education needs to include, as part of curriculum, a one month contact programme between scientists and students from India and other countries (to start with SAARC and select south east Asian countries). It has been unambiguously demonstrated by Indo-US science and technology forum that providing students and young scientists with an exposure to cutting-edge scientific research experiences at a formative stage not only broadens their intellectual horizons but also leads to increased engagements in scientific and technological research careers. We also need to expose young researchers and peers to interact with common man to build a meaningful bondage, essential to make our scientific pursuits useful to the community. One of the modes is to have an "environmental ride", similar to AGU`s cycle ride. *The American Geophysical Union (AGU) is participating in Climate Ride for the second year! Climate Ride is a non-profit organization that offers 5-day, staff-supported bike rides or hikes through beautiful areas of the United States to increase awareness for sustainability and raise money for organizations working on issues related to climate change, sustainability, and other environmental causes. By taking part in one of the rides, participants not only challenge themselves physically but also have the opportunity to network with like-minded peers and meet bright minds in policy, advocacy, and innovation.*

(**Source:** Ambrogio, O. (2015), Climate Ride: Are you up for the challenge?, *Eos, 96,*doi:10.1029/2015EO030923. Published on 3rd June 2015.)

Let us hope such expeditions to Northeast India and Himalayan Foot Hills by north and east Indian Geophysics students and faculty (a total of 30 to 40 students and 10 faculty members) will open a new vistas and motivate young researchers to pursue scientific research to come out with area specific approaches and remedies to arrest environmental degradation. Simultaneously, south and western Indian Students can take up climate Ride to explore Western Ghats and Deccan Volcanic Province. At the

end of the expedition all can meet at a central place (Bhopal or Hyderabad) and have a two day interactive session. IGU can organise it with sponsored support from MOES and DST.

Sustainability:

A friend of mine asked me, after going through my article on Sustainability or Resilience (Jan, 2015, JIGU), whether I really believe in sustainability, when we are witnessing large scale destruction of our environment and uncontrolled pollution of life saving water, air and food. It is not easy to answer, as I do have my own doubts. Yet, I do believe we can achieve sustainability if at least 30% of our population (especially the youth) come forward and find practical solutions to vexed issues. They need to revolutionize our way of thinking regarding quality of life. I do know that as of now we are yet to find long lasting solutions to ensure sustainability. However, we need to be optimistic to overcome many hurdles. While we aim at sustainable development, we need to strengthen ourselves by getting needed resilience capability, as dreams alone cannot help us. Sustainability at times can feel pretty abstract, yet the challenges we are dealing with are far from abstract. Whether protecting biodiversity, reducing emissions, lessening inequality or improving health, the issues that sustainability encompasses are very real, tangible and touch us all in many different ways. We need to look at how issues and approaches are shaped by the real experience and knowledge of an area, culture or community - the 'place' of sustainability is paramount.

The current state of sustainability needs to be evaluated in view of unresolved issues associated with climate change/global warming. Inexplicably, these issues have dominated every nation`s agenda. Amidst a chaotic environment, our communities, workplaces and cultures are grappling with a broad set of socio-economic issues around ethics, equity and rights. It is time we give needed attention to our local and regional issues, by adopting a pragmatic approach. I am impressed by a snapshot of some of the most recent travels of a voluntary SustainAbility team – the places that they have been connecting with through work and leisure. The team also share what they have been reading – what has influenced how they make sense of the world and their work? Those interested can have an insight in to these initiatives by viewing at this link (**Source**:http://www.sustainability.com/library/radar-issue-06). It is argued by many experts that sustainable development is affected by the ill effects of global warming and climate change. Basically the two are different and highly asymmetric. However, both have assumed importance due to various socio-economic issues and global politics. It is necessary for us to concentrate on environmental wellbeing and natural resource security, reducing different types of pollution and short term benefits. Once this is done and we succeed in motivating our common man to be aware of the significance of his contribution to the wellbeing of his locality, region and the country, we will automatically develop unity in diversity and build a strong community that can face setbacks with a pragmatic resilience approach. This in turn ensures sustainable development. As our contribution, scientists need to carry out an in depth analysis of existing scenario and then advocate implementation of such changes that are viable and project the achieved results through efficient interaction with all the stake holders. We can then release our success story, for consideration and appreciation by the developed and developing societies, worldwide. I have covered these topics quite extensively through editorials. Some new insights will be covered in January, 2016 editorial, to expose the readers to existing gaps in international understanding of the problem.

Some of my friends pointed out that my editorials, even though useful and informative, have become highly loaded towards societal issues. They wanted inclusion of topics that are exciting. In response to this (as mentioned in July editorial) I present below some details that (according to me) are exciting and to a greater extent mindboggling.

Space and Time & Universe:

Man, being inquisitive, always thinks of doing something new. The stories written about space travel, movies on time travel excited one and all. It is interesting to know from recent studies there is a possibility of travelling back in time and travel

through our galaxy, which theoretically seems to contain a worm like structure that makes travel through it feasible. At the same time we are bamboozled by the theories proposed by two schools of thought on TIME. Some details are given below mainly to introduce an inquisitive reader to these highly imaginative scientific pursuits, based on differing philosophies. I do, however, caution that once any one develops a liking for these theories he needs to first develop proficiency to wriggle him out of self created cobweb. Cosmology is a dense forest and none knows its depth and width. I begin this journey first trying to understand the basics of Cosmology and proceed ahead telling about important aspects of Space and Time & Universe and finally end after covering some very recent research findings, hoping the readers would continue the journey beyond.

Cosmology is the study of the origin, evolution, and eventual fate of the universe. Physical cosmology is the scholarly and scientific study of the origin, evolution, large-scale structures and dynamics, and ultimate fate of the universe, as well as the scientific laws that govern these realities (and probably some illusions). Physical cosmology is studied by scientists, such as astronomers and physicists, as well as philosophers, such as metaphysicians, philosophers of physics, and philosophers of space and time. Because of this shared scope with philosophy, theories in physical cosmology may include both scientific and non-scientific propositions, and may depend upon assumptions that cannot be tested. Cosmology differs from astronomy in that the former is concerned with the Universe as a whole while the latter deals with individual celestial objects. Modern physical cosmology is dominated by the Big Bang theory, which attempts to bring together observational astronomy and particle physics; more specifically, a standard parametrisation of the Big Bang with dark matter and dark energy, known as the Lambda-CDM model.

When Isaac Newton published the Principia Mathematica in 1687, he finally figured out how the heavens moved. Newton provided a physical mechanism for Kepler's laws and his law of universal gravitation allowed the anomalies in previous systems, caused by gravitational interaction between the planets, to be resolved. A fundamental difference between Newton's cosmology and those preceding it was the Copernican principle—that the bodies on earth obey the same physical laws as all the celestial bodies. This was a crucial philosophical advance in physical cosmology. Evidence of gravitational waves in the infant universe may have been uncovered by the microscopic examination of the focal plane of the BICEP2 radio telescope.

Modern scientific cosmology is usually considered to have begun in 1917 with Albert Einstein's publication of his final modification of general relativity in the paper "Cosmological Considerations of the General Theory of Relativity". General relativity prompted cosmologists to explore its astronomical ramifications, which enhanced the ability of astronomers to study very distant objects. Physicists began changing the assumption that the Universe was static and unchanging. In parallel to this dynamic approach to cosmology, one long-standing debate about the structure of the cosmos was coming to a climax. Astronomer Harlow Shapley championed the model of a cosmos made up of the Milky Way star system only; while Heber D. Curtis argued for the idea that spiral nebulae were star systems in their own right as island universes. This difference of ideas came to a climax with the organization of the Great Debate on 26 April 1920. The debate was resolved when Edwin Hubble detected novae in the Andromeda galaxy in 1923 and 1924. Their distance established spiral nebulae well beyond the edge of the Milky Way. Subsequent modelling of the universe explored the possibility that the cosmological constant, introduced by Einstein in his 1917 paper, may result in an expanding universe, depending on its value. Thus the Big Bang model was proposed by the Belgian priest Georges Lemaître in 1927, which was subsequently corroborated by Edwin Hubble's discovery of the red shift in 1929 and later by the discovery of the cosmic microwave background radiation by Arno Penzias and Robert Woodrow Wilson in 1964. These findings were a first step to rule out some of many alternative cosmologies.

Since around 1990, several dramatic advances in observational cosmology have transformed cosmology from a largely speculative science into a predictive science with precise agreement between theory and

observation. These advances include observations of the microwave background from satellites, large new galaxy redshift surveys , and observations of distant supernovae and gravitational lensing. These observations matched the predictions of the cosmic inflation theory, a modified Big Bang theory, and the specific version known as the Lambda-CDM model. This has led many to refer to modern times as the "golden age of cosmology".

On 17 March 2014, astronomers at the Harvard-Smithsonian Center for Astrophysics announced the detection of gravitational waves, providing strong evidence for inflation and the Big Bang. However, on 19 June 2014, lowered confidence in confirming the cosmic inflation findings was reported. On 1 December 2014, at the Planck 2014 meeting in Ferrara, Italy, astronomers reported that the universe is 13.8 billion years old and is composed of 4.9% atomic matter, 26.6% dark matter and 68.5% dark energy. (**Source**: https://en.wikipedia.org/?title=Cosmology)

The above details introduce readers to basics and evolution of Cosmology, an essential input to resolve various theories on space and time & universe. Now let us look in to some specifics.

The large-scale structure of the Universe

Research over the past three decades has led to the view that the rich tapestry of present-day cosmic structure arose during the first instants of creation, where weak ripples were imposed on the otherwise uniform and rapidly expanding primordial soup. Over 14 billion years of evolution, these ripples have been amplified to enormous proportions by gravitational forces, producing ever-growing concentrations of dark matter in which ordinary gases cool, condense and fragment to make galaxies. This process can be faithfully mimicked in large computer simulations, and tested by observations that probe the history of the Universe starting from just 400,000 years after the Big Bang. (**Source:** Volker Springel et al; Nature **440**, 1137-1144 (27 April 2006) | doi:10.1038/nature04805).

Space-time is not the same for everyone

Before the Big Bang, space-time as we know it did not exist. So how was it born? The process of creating normal space-time from an earlier state dominated by quantum gravity has been studied for years by theorists. Recent analyses suggest a surprising conclusion: not all elementary particles are subject to the same space-time. "Particles with mass not only experience different space-times than photons do, but each sees its own private version of space-time depending on the direction it moves in. This finding really took the scientists by surprise.

Does this latest discovery mean that the Universe of particles with mass is not isotropic? Such an assertion would be of huge experimental and observational importance. However, the answer is no, the Universe does not have a preferred direction. Observers studying the behaviour of elementary particles came out with a statement that it is not important what each particle "experiences" of its space-time. They further asserted that regardless of the direction of flight, all particles recorded in the laboratory will have exactly the same characteristics. For this reason, experimentally confirming the theoretical predictions assumes significant importance. (**Source**:http://www.sciencedaily.com/releases/2013/07/130709115344.htm).

Computer Simulation Confirms the Possibility of Time Travel

Using photons, Australian scientists managed to create a model in which quantum particles can move back in time. As it turned out, the laws of standard quantum mechanics may be violated at the same time. Physicists from the University of Queensland in Australia set out to simulate a computer experiment, which could prove the possibility of time travel at the quantum level, predicted in 1991. They managed to simulate the behaviour of a single photon passing through a wormhole in space-time in the past and engaging with itself. Such a trajectory of a particle is called a closed time like curve, i.e. a photon returns to the original space-time point and its world line closes.

The researchers studied two scenarios. In the first, the particle passes through a wormhole, returning to the past, and interacts with itself. In the second scenario, the photon, forever enclosed in a closed time like curve interacts with another, ordinary particle. According to the scientists, their work will make an important contribution to the unification of the two great theories in physics, which till this moment had little in common: the Einstein's general theory of relativity and quantum mechanics."Einstein's theory describes the world of stars and galaxies, while quantum mechanics studies mainly the properties of elementary particles, atoms and molecules," said Martin Ringbauer of University of Queensland.

Einstein's General Relativity allows the possibility of travelling back in time to the object, which gets stuck in a closed time like curve. However, this possibility can cause a number of paradoxes: a time traveller could, for example, prevent his parents from meeting each other, and thus make his own birth impossible. In 1991, it was suggested for the first time that time travel in the quantum world can prevent such paradoxes, since the properties of quantum particles are not precisely defined, according to Heisenberg's uncertainty principle. Computer simulations created by the Australian scientists allowed them to study the behaviour of quantum particles in such a scenario. At the same time, new interesting effects were revealed, the occurrence of which is considered impossible according to the standard quantum mechanics. For example, it turned out that it is possible to accurately identify the various states of a quantum system, which is quite possible if we remain within the framework of the quantum theory. (**Source**: Martin Ringbauer *et al*. 2014. Experimental simulation of closed timelike curves. *Nature Communications* 5, article number: 4145; doi: 10.1038/ncomms5145.).

For a lay man it is beyond imagination to understand such a phenomenon, without believing in the omnipotence of the omnipresent;The Almighty. In scientific realm, such a phenomenon is difficult to explain, without knowing in detail what existed prior to Big Bang. We also need to know in detail the dimensions of the universe, its dynamics in space and time, the intricate linkage between various contents of the universe, the similarities between micro and macro structures present in the universe to unravel the meaning of Virat Swaroop (all pervasive force that has control over all that exist in the universe).

While these theories started ripples in scientific thought process another study came out with a theory that can make our dreams of reaching exoplanets and understand structure and dynamics of galaxy, a reality.

Interstellar-style wormhole exists in Milky Way?

An Interstellar-style space-time tunnel may exist in the Milky Way and we could even travel through it, according to a new theory proposed by an international team of scientists, including those from India. Based on the latest evidence and theories our galaxy could be a huge wormhole and, if that were true, it could be "stable and navigable," scientists say. "If we combine the map of the dark matter in the Milky Way with the most recent Big Bang model to explain the universe and we hypothesize the existence of space-time tunnels, what we get is that our galaxy could really contain one of these tunnels, and that the tunnel could even be the size of the galaxy itself. But there's more," said Paolo Salucci, astrophysicist of the International School for Advanced Studies (SISSA) of Trieste, Italy, and a dark matter expert. "We could even travel through this tunnel, since, based on our calculations, it could be navigable," Salucci said. The research was published in a paper in the Annals of Physics, which Salucci authored with Farook Rahaman from Jadavpur University in Kolkata and a group of Indian and North American researchers."Obviously we are not claiming that our galaxy is definitely a wormhole, but simply that, according to theoretical models, this hypothesis is a possibility," said Salucci. (**Source**: http://earthsky.org/space/is-our-milky-way-a-wormhole).

Even though the above articles tell us about recent successful research initiatives, there are number of unresolved issues involving quantum mechanics and Einstein's General Relativity. There is a considerable debate on **Time.** Any topic associated with TIME needs a philosophical approach to make it useful. Thinkers, philosophers and scientists have been searching for the truth and doing research on the

reality of time, since time immemorial. Time is intricately associated with the universe. No research on universe can ignore the implicit role played by Time. Any write up covering this topic cannot satiate the thirst of an inquisitive reader. There are different opinions and theories. It is just impossible even to go through the innumerable number of articles; leave aside understanding them. I place before you some beliefs/ theories from highly motivated scientists. I have no illusions about my capabilities or lack of capabilities in unravelling the truth, as my exposure to such high level of research is minimal. Details given cover not even 0.1% of existing knowledge. But, the information may be useful in introducing this exciting topic to inquisitive reader. Please try to unravel the truth.

It is our perception of the truth that helps us to segregate reality from illusion. Richard Feynman, a renowned physicist, said "Time is what continues when everything else stops" (http://www.feynmanlectures.caltech.edu/).In physics time runs behind or independently of anything that occurs in the universe. In physics time is not part of the physical universe! Clearly the belief in physics is that time does not exist in the physical universe. That said many physical systems seem well described by time-invariant laws. Physicists also have a good grasp of how time-irreversible effective laws can emerge from time-reversible fundamental laws. We all know, in universal time span our life span is insignificant. As pointed out by Sean Carroll "We find ourselves, not as a central player in the life of the cosmos, but as a tiny epiphenomenon, flourishing for a brief moment as we ride a wave of increasing entropy. Purpose and meaning are not to be found in the laws of nature, or in the plans of any external agent. It is our job to create them. One of those purposes — among many — stems from our urge to explain the world around us the best we can. If our lives are brief and undirected, at least we can take pride in our mutual courage as we struggle to understand things much greater than ourselves." This very zest to unravel the mysteries associated with our existence encouraged great Thinkers and Philosophers to ponder over various facets of time, space and life and come out with number of theories (**Source:** https://www.ted.com/talks/sean_carroll_distant_time_and_the_hint_of_a_multiverse?language=en).

The complicated nature of Cosmology and studies to understand the dynamics of UNIVERSE have added a new dimension, as seen from a recent study by an Indian and Egyptian scientists, making the ongoing debate much more interesting.

Big Bang never happened? New theory says universe has no origin, no end

Did Big Bang not happen at all? A new theory proposed by two researchers suggests that the universe did not originate with the Big Bang and it has no beginning, no end. According to Ahmed Farag Ali from Egypt's Benha University and Saurya Das from the University of Lethbridge in Canada, universe was not born with the Big Bang. The physicists stated that going by the quantum mechanics, Big Bang did not mark the birth of the universe. On the contrary, they state that the universe existed perpetually and has neither a beginning nor an end. The physicists have based their proposition on a new model that they have developed. The new model applied quantum correction terms to the theory of general relativity given by Einstein, according to which, the universe was born when an extremely dense single point bursting outwards around 13.8 billion years ago. This state, termed singularity does not consider what took place either before the Big Bang or at the time of the Big Bang. After removing singularity, the new model shows that the universe forever existed in quantum potential prior to its collapsing into the Big Bang. The new model, also took into account dark energy and dark matter, and predicted a cosmological constant, according to which, the universe is not expanding but is static. (**Source**: http://www.delhidailynews.com/news/Big-Bang-never-happened-New-theory-says-universe-has-no-origin--no-end-1424036788/).

Scientists propose existence and interaction of parallel worlds: Many Interacting Worlds theory challenges foundations of quantum science

Academics are challenging the foundations of quantum science with a radical new theory on parallel universes. Scientists now propose that parallel universes really exist, and that they interact. They show that such an interaction could explain everything that is bizarre about quantum mechanics.

In a paper published in the journal Physical Review, Professor Howard Wiseman and co-authors took interacting parallel worlds out of the realm of science fiction and into that of hard science. The team proposes that parallel universes really exist, and that they interact. That is, rather than evolving independently, nearby worlds influence one another by a subtle force of repulsion. They show that such an interaction could explain everything that is bizarre about quantum mechanics.

Quantum theory is needed to explain how the universe works at the microscopic scale, and is believed to apply to all matter. But it is notoriously difficult to fathom, exhibiting weird phenomena which seem to violate the laws of cause and effect.

As the eminent American theoretical physicist Richard Feynman once noted: "I think I can safely say that nobody understands quantum mechanics."

However, the "Many-Interacting Worlds" approach developed at Griffith University provides a new and daring perspective on this baffling field."The idea of parallel universes in quantum mechanics has been around since 1957," says Professor Wiseman."In the well-known "Many-Worlds Interpretation," each universe branches into a bunch of new universes every time a quantum measurement is made. But critics question the reality of these other universes, since they do not influence our universe at all. On this score, our "Many Interacting Worlds" approach is completely different, as its name implies."

Professor Wiseman and his colleagues propose that:

- The universe we experience is just one of a gigantic number of worlds. Some are almost identical to ours while most are very different;
- All of these worlds are equally real, exist continuously through time, and possess precisely defined properties;
- All quantum phenomena arise from a universal force of repulsion between 'nearby' (i.e. similar) worlds which tends to make them more dissimilar.

"Many-Interacting Worlds" theory may even create the extraordinary possibility of testing for the existence of other worlds."The beauty of our approach is that if there is just one world our theory reduces to Newtonian mechanics, while if there are a gigantic number of worlds it reproduces quantum mechanics. In between it predicts something new that is neither Newton's theory nor quantum theory. We also believe that, in providing a new mental picture of quantum effects, it will be useful in planning experiments to test and exploit quantum phenomena." Authors claim.

The ability to approximate quantum evolution using a finite number of worlds could have significant ramifications in molecular dynamics, which is important for understanding chemical reactions and the action of drugs. Texas Tech University scientists have observed: "These are great ideas, not only conceptually, but also with regard to the new numerical breakthroughs they are almost certain to engender."

(**Source**: Michael J.W. Hall et al, Quantum Phenomena Modeled by Interactions between Many Classical Worlds. Physical Review X, 2014; 4 (4) DOI: 10.1103/PhysRevX.4.041013.)

A team led by David Sobral, from the Institute of Astrophysics and Space Sciences, the Faculty of Sciences of the University of Lisbon in Portugal, and Leiden Observatory in the Netherlands, has used Very Large Telescope (VLT) to peer back into the ancient Universe, to a period known as reionisation, approximately 800 million years after the Big Bang. Instead of conducting a narrow and deep study of a small area of the sky, they broadened their scope to produce the widest survey of very distant galaxies ever attempted. Within CR7, bluer and somewhat redder clusters of stars were found, indicating that the formation of Population III stars had occurred in waves — as had been predicted. What the team directly observed was the last wave of Population III stars, suggesting that such stars should be easier to find than previously thought: they reside amongst regular stars, in brighter galaxies, not just in the earliest, smallest, and dimmest galaxies, which are so faint as to be extremely difficult to study.

(**Source:** "Evidence for PopIII-like stellar populations in the most luminous Lyman-α emitters at the epoch of re-ionisation: spectroscopic confirmation", by D. Sobral, et al., accepted for publication in The *Astrophysical Journal*. June,2015 http://www.eso.org/public/news/eso1524/).

In spite of these significant studies we have to go a long way to unravel many unknowns. The quest continues and will continue, for times to come. In spite of considerable growth in our knowledge base, as pointed out by Stephen Hawking, a great thinker of our times …He has posed number of questions like "What do we know about the universe, and how do we know it? Where did the universe come from, and where is it going? Did the universe have a beginning, and if so, what happened before then? What is the nature of time? Will it ever come to an end? Can we go back in time?" and tried to unravel many mysteries associated with the Universe, by debating many theories with his friend Penrose. It is an interesting reflection on the general climate of thought before the twentieth century that no one had suggested that the universe was expanding or contracting. It was generally accepted that either the universe had existed forever in an unchanging state, or that it had been created at a finite time in the past more or less as we observe it today. In part this may have been due to people's tendency to believe in eternal truths, as well as the comfort they found in the thought that even though they may grow old and die, the universe is eternal and unchanging. Recent breakthroughs in physics, made possible in part by fantastic new technologies, suggest answers to some of these longstanding questions. Someday these answers may seem as obvious to us as the earth orbiting the sun – or perhaps as ridiculous as a tower of tortoises

(**Source**: Stephen Hawking & Roger Penrose, 1997; The nature of space and time & Brief History of Time - Stephen Hawking, 1998; http://www.amazon.com/Brief-History-Time-Stephen-Hawking/dp/0553380168).

Only time (whatever that may be) will tell when such a development takes place. But, definitely not during my time. After reading the above I am reminded of a Vedic Hymn:

The Hymn of Creation (Nasadiya Sukta of Rg Veda (10-129)) says:

Who verily knows and who can here declare
it, whence it was born and whence came
this creation?
The gods are later than this world's
production. Who knows?
Then whence it first came into being?
He, the first origin of this creation, whether
he formed it all or did not form it?
Whose eyes control this world in highest
heaven, he verily
knows it or perhaps he knows not

I think these theories and counter theories expose us to the reality….We are groping in dark and yet to know many things associated with Universe, Space and Time. To paraphrase Einstein, "Reality is merely an illusion*, albeit a very persistent one."*It is the very urge to educate self is responsible for the thinkers to formulate laws and verify them through experiments. It is easy to say our theories can answer many cosmological questions. But, the reality is as we go deep in pin pointing the basic origin/ source of many natural phenomena, we are exposed to the reality…..we know very little. At times when I come across these presentations I go into a slumber, imagining the role played by an individual (a speck in an ocean) in unravelling many unknowns which neither have a beginning nor an ending. It is time all of you have such an experience to enjoy reading these theories and counter theories.

In this issue:

In this issue apart from editorial, news and views and a book review eleven research articles have been included. In the first article "Thermal evolution of Indian cratonic lithosphere" Singh pointed out that thermal evolution of the Indian cratonic lithosphere can be deciphered by using the heat conduction equation with the thermal properties and other related information, such as heat flow values and pressures, temperatures and ages derived from rocks of various terrains. The few problems of the Indian cratonic lithosphere, which have been addressed as initial/ boundary problems or changes in the heat sources

or addition of advection term in the heat conduction equation are described in this review. In the second paper "Geological and Geotechnical Characterisation of Ramagundam Opencast-II of Singareni Collieries using Geophysical Logs" UdayBhaskar et al stated that planning and managing large open pits depends upon a thorough understanding of geological and geotechnical aspects of the rock strata comprising the overburden column. This paper presents usage of different geophysical logs at the proposed deep pit at Opencast-II Expansion Project of Ramagundam, SCCL. In the third article " Recharge rate in a carbonate rock covered watershed in Kurnool district, Andhra Pradesh, India using Tritium injection and Soil Water Balance methods" Dar et al noted that Groundwater in the carbonate aquifers of the southern Andhra Pradesh, India has approached stress level as water table has declined due to increasing groundwater draft, low to moderate rainfall, less availability or absence of surface water sources and semi-arid climate. In order to manage the aquifers for sustainable water supply, understanding and accurate assessment of groundwater recharge is necessary. Two approaches, namely, soil water balance and injected tritium tracer methods were used to estimate the recharge. The research study demonstrated that the recharge could be estimated over a watershed/sub-basin area by integrating spatial tritium injected estimates and soil water balance method. In the fourth paper "Dynamics of Hamtah Glacier, Lahaul & Spiti, Dist, H.P", Shukla et al informed that understanding the glacier dynamics is significant for understanding the response of the glacier to the changing climate. They observed that the annualized summer flow velocities (Um*12) and the annual flow velocities (Ua) deduced from field measured summer flow and annual flow respectively show considerable variations, including during different observational years. In the fifth paper "Application of MODFLOW for Groundwater Seepage Problems in the Subsurface Tunnels", Surinaidu et al indicated that the construction of subsurface structures such as Tunnel beneath the water table causes the groundwater seepage into the structure, leading to instability of the structure. A finite difference based groundwater flow model was constructed using the inferences from hydro-geo-morphological and geologic lineaments to estimate the groundwater seepage and to find out the possible solution. To overcome the seepage problem perforated pipes were successfully installed in the Tunnel. In the sixth paper "Geophysical Investigations for Delineation of Gondwana Sediments below Deccan Trap beyond the Western Limit of Wardha Valley Coalfields……..,-a comprehensive analysis of case studies", Naskar and Saha detailed about a study in Wardha valley that helped in identification and evaluation of concealed Gondwana (coal bearing at places), under the Deccan trap cover, using geophysical inputs. The geophysical exploration was done by using magnetic (VF) and electrical surveys in three blocks in and adjoining part of Wardha valley, which hither to was not explored using Geophysical investigations. In the seventh paper " Palaeomagnetic and Rock magnetic investigations on Gadwal "Dike 2", eastern Dharwar craton, India", Venkateshwarlu and Khanna presented results of Rock magnetic studies. The studies indicate that the main remanence carrier resides in multi-domain Magnetite. Palaeomagnetic results infer a mean direction and a pole position. This pole is in conformity with the poles determined for Cuddapah dykes and those in the peninsular India. In the eighth paper "Role of Biogenic Hydrocarbon on the Variability of Total Rainfall Amount over Sundarban, Kaziranga and Gir Forests" Midya et al carried out a critical analysis of the yearly variation of rainfall with tropospheric ozone for three Indian forest zones. The Analysis shows that low temperature of troposphere, presence of sufficient water vapour, and CCN (Cloud Condensation Nuclei) are not sufficient for generating rainfall. From the study it is noticed that the amount of rainfall showed an overall increasing trend with increasing tropospheric ozone concentration for all the three forest zones. In the ninth paper "Variations in Atmospheric Structure and Wave Activity in Changing Monsoon Conditions over Mahabubnagar, as observed during Caipeex-2011" Narkhedkar et al stated that their study has indicated the presence of gravity waves over this tropical station, during monsoon period. It is inferred that the wind shear and tropical convection associated with weather disturbances are possible sources of excitation of such waves over the location. In the tenth paper "Sensitivity study of Matched Field

Processor and Geoacoustic Inversion with combined BMV processor" Naithani et al stressed that estimation of geoacoustic parameters via Matched Field Inversion is controlled by many factors. In this paper the performance of Bartlett and Minimum Variance processors with respect to sensitivity of geoacoustic parameters, acoustic frequencies and signal to noise ratio has been evaluated. The inversion results show that the joint usage of both the processors gives better estimates and can be used for matched field geoacoustic inversion. In the last paper Reddy has presented an overview of irrigation tanks rehabilitation in semi arid hard rock terrain.

I am happy to state that in general technical content of the papers has shown an upward trend. However, final structuring of some papers needed considerable editing. This is a chronic problem and needs focused attention of the authors.

In News and Views at a Glance, as in the past, 4 subsections have been included. As last article a book review is added.

With this issue we have competed publication of 19 volumes (1997 to 2015), which I consider a significant achievement amidst various hurdles.

This issue is dedicated in honour of Late Dr.A.P.J.Abdul Kalam, former President of India, a man of exemplary character, a visionary of highest order, a great scientist and a believer in Indian culture ..

P.R.Reddy