

Earth Day at the Indian Institute of Science, Bangalore

Much has been written about the uniqueness of the planet Earth, its dynamic and precarious equilibrium and about the processes that continue to shape its evolution. Global warming, over-population, and other critical environmental issues are pushing nations and citizens to do as much as they can, to preserve the planet's finite natural resources and its environment. This is the spirit of "Earth Day", celebrated for the first time on 21 March, 1970 and observed every year thereafter. Gaylord Nelson, the U.S. Senator from Wisconsin is credited for popularizing this event, and observing it on 22 April 1970 as a day of environmental education and activism. Entering the 29th year, "Earth Day" is now observed around the world with celebrations marked by essay and painting competitions, launching of environment-friendly products, campaigns by student groups and environmental activists and so on. Across barriers of cultures, races and languages, the message is the same – a plea to understand, protect and preserve the Earth.

The Indian Institute of Science (IISc), Bangalore has joined these efforts this year, through a half-day meeting on the forenoon of 22 April 2009, organized by its recently created Centre for Earth Sciences (CEaS). Targeted for high school students, this event was sponsored by the Ministry of Earth Sciences, Government of India. More than 150 high school students from various parts of Bangalore city attended this meeting,

which debated on themes from the extinction of dinosaurs, to global climate change and tsunami hazard. Inaugurating the meeting, Prof. Roddam Narasimha (Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore) emphasized the significance of earth science education. The technical session featured four scientific presentations. In his talk on "What have satellites contributed to our understanding of Earth's climate?", Prof. J. Srinivasan, Divecha Centre for Climate Change (another newly created centre at IISc), illustrated how the advances in satellite telemetry during the last 50 years have improved the global perspective of weather and climate processes on the Earth. For example, a comparison of satellite data from the Venus and the Earth revealed the important role played by carbon dioxide in controlling climate on the Earth. While the global mean surface temperature of the Venus is around 420°C, on the Earth it is only 15°C, the amount of carbon dioxide in the atmosphere accounting for this difference. Srinivasan's lecture highlighted how the satellites have provided, for the first time, an accurate estimate of the sea-surface temperatures around the world, leading to a better understanding of the El Nino phenomenon in the tropical Pacific Ocean. Many new satellites carry LIDAR (Light Detection and Ranging using Lasers) that reveal the presence of aerosols and clouds, and the availability of more than 1000 million observations per day has improved

weather forecasting and climate predictions. The inaugural address by Prof. Roddam Narasimha and the lecture by Prof. J. Srinivasan transpired the excitement, relevance and challenges in earth science research, inspiring the young students.

A warmer world, rising sea levels, melting glaciers and vanishing forests and grasslands necessitate newer survival strategies for a whole species of plants and animals. And some may migrate to newer locations, some others may adapt and yet others may just perish. "Turning up the heat: living in a warmer world", the lecture by Prof. R. Sukumar (Centre for Ecological Studies, IISc) was a peek into what the climate change would mean, to many environment-sensitive species, such as the Nilgiri Tahrs and the Indian Tigers, which are already on the brink of extinction. In the scenario that Prof. Sukumar projected, shrinking forests and rising temperatures would affect a large number of species, many varieties of flora and fauna could disappear and some may adapt in the changing environment. The changing global climate is not a threat to humans alone, it would permanently alter the intricate and interdependent ecological systems.

The 4.5 billion year long history of the Earth is punctuated by many extreme events, some of which culminated in mass extinctions, such as the disappearance of the dinosaurs, around 65 million years ago. Did the meteoritic impact (Chicxulub) cause the Cretaceous-Tertiary (K-T) boundary

extinctions? There is a growing body of evidence that suggests that the impact predates the extinction of tens of thousands of years, and if so, what caused the mass extinction? Prof. Sunil Bajpai's (IIT Roorkee) talk on 'India's northward drift and collision with Asia: impact on global extinctions and origins' gave a different perspective. Presenting the highlights of his recent, fascinating discoveries from India, Prof. Bajpai argued that the Deccan volcanism was the main cause of the K-T boundary mass extinctions. The graveyards of dinosaur bones and eggs preserved within the sedimentary rocks beneath the Trap basalts bear testimony to the contemporariness of these two major geological catastrophes. The geological records that Prof. Bajpai brought to light were mostly that of Eocene vertebrates that once thrived in today's Gujarat – predecessors of modern mammals such as whales, horses, primates and sea cows. Major events in the Earth's history, such as the K-T boundary impact and the Deccan Trap volcanism, are known to have shaped the course of biological evolution. Yet another event during the same time span, the India-Asia collision during

40-60 million years ago, played a major role in the evolutionary history of this region.

The movement of the lithospheric plates, their collision and subduction lead to major catastrophes – volcanoes, earthquakes and tsunamis. Inevitable in the course of evolution of a planet, these events have sculptured the Earth for hundreds of millions of years and they will continue to do so, in future. The talk on "Tsunamis: an Ocean in turmoil" by Dr. C.P. Rajendran, (CEaS, IISc), was a journey through regions around the world, devastated by great tsunamis and displaced thousands of people. Unanticipated massive sea waves triggered by great earthquakes that inundated coasts of Lisbon (1755), Chile (1960), Alaska (1964) and the Sumatra-Andaman (2004) tell similar stories of devastation and death. Geology preserves imprints of tsunamis that have visited the coasts in the past, signaling that they can visit again, in future. This is the science of tsunami geology – probing the coastal geological records to identify imprints of past earthquakes and tsunamis. Geologists are like detectives spying on the Earth's secrets, digging into its mysteries taking out hidden clues on its eventful past

and using them to forecast what lies ahead. Humans have overpowered nature in many ways, but the ultimate power rests with nature and to live on Earth is to understand this power.

The Earth Day at IISc was certainly exciting for the young students who participated in the event and interacted with the speakers. How did the dinosaur egg survive the heat of the volcanic flow? What would have happened, had the dinosaurs not become extinct? Would the course of human evolution have changed? Why did Indian plate choose to move north, rather than south? These are some of the questions the students' asked. Perhaps, that is the essence of celebrating the Earth Day, learning to appreciate the Earth's unique history and to be sensitive about its future. We from IISc, hope that the Earth Day movement will gather more momentum in the years to come and becomes a much sought after venue for student-expert interaction on the environmental issues of the world.

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