Notes and News

One Day Seminar on "Public Understanding of Science"

To commemorate the birth centenary of Professor Purnendu Kumar Bose (1916- 1993), Indian Science News Association (ISNA) and Indian Association for Productivity, Quality and Reliability (IAPQR) jointly organized a one day seminar on "Public Understanding of Science" on 24th February, 2017 at Bose Institute, Kolkata in collaboration with National Academy of Sciences, India (NASI), Kolkata Chapter.

In the inaugural session, Prof. Asis Chattopadhyya, Secretary, IAPQR welcomed the participants. He explained the theme of the seminar, and in his opinion"public understanding" is a controversial issue.

Professor P.K. Ray,President of ISNA gave an introductory lecture on ISNA, which is a heritage organization, founded in 1935 by eminent scientists like Acharya Praffulla Chandra Ray, Prof. Meghnad Saha, etc. The purpose was to promote diffusion of knowledge, laying special stress on the progress of scientific studies. The journal Science and Culture, the mouth piece of ISNA was first published in 1935 which has been publishing since then uniterrupted. The speaker also mentioned that ISNA organizes seminars, symposia and training programmes to disseminate scientific knowledge and awareness for the public. The training programme on 'Science Communication and Media Practice' is being held each year since 1983.

The next speaker was Prof. S.B. Bagchi, Chairman IAPQR reported that IAPQR representing industrial executives, R&D workers, College and University teachers, medical and agricultural scientists etc. has about 400 members. Current activities of the Association include organization of short term and long term training programme in Quality-related areas, holding annual conferences, seminars, symposia, lecture,workshops in different parts of the country. The speaker also mentioned that his Association observes World Quality Day in the month of November every year.

Prof. Bishnupada Chatterjee, Secretary, NASI Kolkata Chapter, gave some details about NASI. National Academy of Sciences, India (NASI) was founded in 1930 in Allahabad with the objectives of providing a National Forum for the publication of research work carried out by Indian Scientists and to provide opportunities for exchange of views among them. Science Communication Activities of the organization includes Children Science Meet, Summer & Winter Schools, Vacation Training Programmes, Workshops, etc. The primary activities of the Kolkata Chapter includes organizing scientific lectures/ seminars at different Research Institutions/ Universities in and around Kolkata on a regular basis by renowned scientists in the area of modern Science.

Prof. Ashutosh Ghosh, Vice Chancellor of Calcutta University delivered the Chief Guest's address. According to the speaker, in order to make school children interested in science, the language used must be the local language understandable to common people.

Professor Sunil Kumar Talapatra, Vice President of ISNA gave his views on the contributions of late Professor Purnendu Bose. From 1971- 1989, Professor Bose was the President of ISNA.

Vote of thanks was offered by Prof. Parimal C. Sen, Honorary Secretary, ISNA.

The first session was chaired by Dr. Hem Sankar Ray, Former Emeritus Professor, CGCRI.The first speaker was Prof. Suprakash C. Roy, Editor in Chief, *Science and Culture* and Convener of the seminar clarified the objectives of the seminar. He mentioned that Dr. P.K. Bose was a staunch supporter of public understanding of science throughout his life and it is befitting to hold a seminar on his birth centenary. If public understood more of science then the world would be a better place to live. Although public includes each and every people of the society, but so far our stress was on the general public and students, but with the advancement of technology it is becoming imperative to educate policymakers. Scientists must also learn to communicate with the public.They must realize that it is their duty to make the public aware of science, particularly in a country like India where science is done with public money. Scientists must also keep contact with journalists, who pass the scientific knowledge to the public in a form that can be understood by them.

Dignitaries sitting on the dais; Prof. Parimal C. Sen (standing), Honorary Secretary, ISNA addressing the audience.

Prof. S.P. Mukherjee, Former Centenary Professor, Department of Statistics, Calcutta University spoke on "*Public Understanding of science- some Implications*". The speaker discussed about myths and superstitions prevalent everywhere. In his opinion, scientific planning and properly designed survey of public understanding of science should be organized on an All India level. He emphasized that difference between science and para-science, pseudoscience, and anti-science must be explained very well to the public. According to Prof. Mukherjee, if scientists are interested in public understanding of science, they should understand the emotions, prejudices of the public very well. Greater understanding of science is necessary for the growth and progress of science in a country. He ended his talk by saying that scientists should engage themselves in public understanding of science and use local language for communication avoiding jargons.

The next speaker Dr. H.K. Majumder, who is President of NASI, Kolkata Chapterspoke on "*Scientific Literacy and its Promotion.*" The speaker emphasized that it is the duty and responsibility of scientists to translate folklore knowledge into science. He also vividly explained what scientific literacy means. Regarding the promotion of science awareness in India, NCSTC- DST plays a pivotal role in the promotion of science. Apart from ISNA, organizations like NASI, CSIR- CPYLS, JBNSTS of West Bengal and KVPY of DST (Government of India) are involved in creating science awareness, some non-governmental organizations are also involved in creating science awareness in India.

Dr. Amber Ghosh, Former Head, S & T, British Council Library was the next speaker who spoke on "*Science Literacy and Communications*". Science according to the speaker is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe. Science literacy encompasses a plethora of themes. The speaker also laid stress on the fact that science can be communicated through mass media, magazines, radio, television, internet, science museums, including mobile exhibits, planetarium, zoos, botanical gardens, etc.

The second session was chaired by Dr. Pijush Das, Scientist, Indian Institute of Chemical Biology.

The session started with the talk of Prof. Parimal C. Sen, Honorary Secretary, ISNA and Professor, Bose Institute on *Science Communicationwith the Public.* In his opinion science literacy is declining worldwide. People should be informed regarding the debate about GM food, nuclear energy, construction of dams, vaccine against diseases, etc. Hence, lot of propagation and campaigning among common people is required to make them aware of such controversial subjects.

Prof. A N Lahiri Majumdar of Bose Institute, spoke on *GM Technology: Public Perception and (mis) Understanding.* He spoke about both positive and negative sides of using GM food. He stressed on the nutritional aspects of GM food giving example of Golden rice, which has high protein content and vitamin A. He quoted Norman Borlaug, NL saying it is better to die after eating GM food than die of hunger.

Dr. Subrata Ghosh**,** Retired Scientist, CGCRI spoke on *Alternative Medicines – Public Understanding of Science.* He explained the principle of Homeopathy and talked about the merits and demerits of use of alternative medicine in comparison to Allopathy, which he termed as "Modern Science Medicine".

Prof. Barun Kumar Chatterjee, Bose Institute talked on *Our Perception of Science* poses some serious questions: How relevant is science to us on a daily basis? What is the public perception of science? Most consider science as fancy and complex. Much of it is fostered by the scientists through the use of jargons. Another feature is

the cargo science concept where a scientific procedure is emulated unscientifically. This causes the observer to perform biased experiments or experiments which cannot be repeated by others. All these produce alienation of scientists and science may be treated as superfluous. This is exhibited in the popular appeal of "Make in India" (in lieu of "Made in India"). Education has to play a role in debunking scientific elitism by making science accessible and understandable to the masses. It should also be understood that progress in science does not usually happen at a regular rate, but in bursts (in relation to the expectation of regular scientific productivity from scientists), but we will never run out of problems to work on as *our knowledge is finite whilst our ignorance is infinite*.

Dr. Anjan Ghosh, talked about *Awareness is more Important than Understanding*. He illustrated the NIS Survey on Kumbh Mela, Allahabad 1989 where a data on 4000 persons showed that people have less knowledge about astronomy and cosmology compared to the awareness about health & hygiene. The reason for this is that media publicize about health and hygiene through advertisement most of the time. He showed that only few lines are dedicated to science in some of the newspapers and maximum numbers of channels avoid science. He stressed that science has to be "marketed" through advertisements/ media to make the public become interested. Only if they become interested, then only they will desire and ultimately start understanding science.

The seminar was well attended by members of ISNA, NASI, IAPQR and also science communicators and media persons. ❐

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Ninth Science Communicators' Meet

Indian Science News Association (ISNA) organised the Ninth Science Communicators' Meet, (SCM 2016) part of the XXX Training Programme which was held on 11th February, 2017 in the Bose Institute Auditorium.

Prof. Biswapati Mukherjee, Chairman of the Organizing Committee welcomed the guests and audience. Prof. Sudhendu Mandal, Honorary Secretary, ISNA briefly stated the genesis of the Association. Dr. Amit Krishna De, Convener of the Organizing Committee narrated the objective of the training course and about the Meet. Prof. S.K. Talapatra, one of the Vice Presidents, ISNA presided over the programme. Prof. Parimal C. Sen offered vote of thanks. The Meet was inaugurated by Dr. R. Gopichandran, Director, Vigyan Prasar. Dr. D.P. Duari, Director, M.P. Birla Planetarium, graced the occasion as Chief Guest.

Dr. D.P. Duari, Director, M P Birla Planetarium, in his address, mentioned that a science communicator should gather the overall knowledge of the subject before presenting a topic in a popular way. It requires a synergy between the scientists and science communicators to obtain true pictures of tall claims. Only in this way the gap between science--scientists-society would be reduced.

Dr. R. Gopichandran, Director, Vigyan Prasar delivered his inaugural address in his inimitable way. He emphasized on the credibility of a science communicator. He felt that a good communicator should be able to create scientific awareness among masses which would lead to further communication followed by action for change within society.

Dr. R. Gopichandran, Director, Vignan Prasar released a *Science Newsletter* prepared by the students of XXX Training Programme on Science Communication and Media Practice.

Following the inaugural programme the technical sessions were started. The theme of the Meet was *"Science Communication : Bridging the Gap between Science and Culture."* The theme was divided into three sessions.

Session I - Role of Scientists

The session I was Chaired by Prof. H.S. Ray Emeritus Professor, Central Glass and Ceramic Research Institute. Prof. Manas Chakrabarty, Former Professor of Bose Institute acted as Co-Chairperson. Dr. Minakshi De, Department of Microbiology, Surendranath College acted as Rapporteur.

There were two speakers in the session. Prof. Syamal Chakrabarti, Dept. of Chemistry, University of Calcutta delivered his lecture on *"A Historiacal Approach in Conceptualizing the Idea of Science Culture in Bengal."* Professor Chakraborti mentioned that only few historians had analyzed the history of our civilization in a broad perspective covering economical aspects, scientific developments and cultural dissemination processes. He quoted from the writings of our luminaries, namely, Professor Surendranath Dasgupta, Professor Hirendranath Mukhopadhyay, Acharya Jagadish Chandra Bose and

Dr. R. Gopichandran delivering inaugural address

Dr. D. P. Duari addressing the audience

Acharya Prafulla Chandra Ray. He also quoted from a Bengalee monthly magazine edited jointly by Radhanath Sikdar and Pyarichand Mitra, which was published to propagate scientific temper and eradicate superstition.

The second lecture was delivered by Prof. Atri Mukhopadhyay on *"Science and Culture: Can a Scientist Make the Twain Meet."*

He defined "culture" as a way of life and "science" as reasoning. He opined that a scientist might be able to present his/her experiences on scientific observations/results but the presentations should be precise and exact. He cited several examples of science writing by our world renowned scientists in their mother tongue. He suggested that a science communicator should approach scientists to grasp the subject of his writing in correct perspective.

Session II - Role of Cultural Exponents

Dr. Pabitra Sarkar, former Vice-Chancellor, Rabindra Bharati University, Education Administrator and former Vice-Chairman, West Bengal State Council of Higher Education and Faculty, Institute of Mass Communication Film and Television Studies and Dr. Buroshiva Dasgupta acted as Chairperson and Co-Chairperson respectively. Dr. Sabyasachi Chattopadhyay, Kalyani University was Rapporteur.

Prof. Atanu Ghosh, Film Director spoke on *"Science Fiction in Indian Cinema – Recent Trends."* Atanu Ghosh tried to explore the recent trends of science fiction film in India. He at first summarized the history in a global perspective–starting from the fantasy film "A Trip to Moon" in French in 1902 to Hollywood blockbusters predicting catastrophic future for mankind. He mentioned about "Bankubabur Bandhu"–a story on alien written by Satyajit Ray who also conceived the idea of making it a science fiction film. Atanu Ghosh named two Bangla and one Tamil films which were released in recent years. The Bangla films were Patalghor and Abby Sen and the Tamil film was Diall for Tamil. To him science fiction films should be a human story narrating the curious relationship between man and his tryst with science.

The second lecture was delivered by Dr. Manas Pratim Das, Executive Officer, Science Cell, All India Radio. The title of his lecture was *"Colours and Chemistry."* Dr, Manas Pratim Das in his presentation on *"Colours and Chemistry"* traced the use of colours in culture in general and painting in particular. He explained the historical lining of the use of different shades of blues in paintings starting from highly luminiscent Egyptian blue to Lapis Lazuli of Afghanistan and then to Ultramarine blue and Azurite. He also pointed out that the artists belonged to Venice, a city nearer to sea, used colours whereas the artists of Florence, being away from sea, mainly concentrated on lines, rather than colours.

Shri Sankya Sanyal, Department of Physics, Jadavpur University delivered his lecture on *"Musically of Human Brain through Fractal Microscope : A Bridge Between Physics, Music and Mind."* Sankhya Sanyal presented a research paper on neurocognitive assessment of emotion. Their works revealed the impact of music on human mind. This research was actually the evaluation of an individual's cultural leanings with the use of technology which might pave way for therapeutic applications.

Session III - Role of Science Communicators

Shri Pathik Guha, Ananda Bazar Patrika took the Chair. Shri Asis Das, Media Consultant acted as Co-Chairperson. Shri Subhendu Chattopadhyay was present as Rapporteur of this session.

There were two speakers in this session. First speaker was Dr. R. Gopichandran, Director, Vigyan Prasar, DST, Govt. of India.

Dr. Gopichandran reminded the science communicators that science is vibrant in our country. One who is engaged in science communication should ask oneself whether he is speaking his own agenda or a scientific agenda. Scientific temper never divides but unifies human race. Thus humility and clarity are essential qualities of any good science writing.

Shri Ashish Lahiri, science writer delivered his lecture on *"Radhanath Sikdar and Colonial Science."*

Ashish Lahiri discussed in detail the life and works of the first trained Indian Scientist par excellence Radhanath Sikdar who, with his mathematical acumen, analyzed the results of the different observers of peak no. XV and confirmed it as the highest peak of the Himalayas. This peak was later named as "Mount Everest". Radhanath Sikdar was far ahead of his time and should be remembered not only for his scientific contributions on geographical survey but also for his fight for nurturing scientific temper in the then Bengalee society.

Dr. K.P. Dhara, Department of Chemistry, Calcutta University concluded the session and he summarized thoroughly the lectures delivered in all three sessions.

Mrs. Rupsha Ghosh dignified the programme with her melodious opening song.

About two hundred participants from different colleges, universities, different scientific organizations participated in this programme. ❐

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National Conference on Effect of Climate Change on Faunal Diversity

A one-day UGC-SAP sponsored National Conference on 'Effect of climate change on faunal diversity' was organized by Department of Zoology, University of Kalyani, Dist. Nadia, West Bengal on 27th February, 2017. In this programme, Dr. D. Nath, Head of Department of Zoology mentioned in her inaugural remarks that studies are being conducted in the department on physiological, behavioural and biochemical changes in organisms due to effect of global climate change and fish used as the adapted animal - 'fish model' has been developed for it. Dr. K. C. Gopi, Additional Director, Zoological Survey of India and noted fish taxonomy researcher presented the first Lead Lecture on 'Impact of climate change on faunal diversity'. He gave a comprehensive overview on faunal wealth of India, the greenhouse effect (that made conducive conditions for life on earth), conditions through which greenhouse gases are eliminated in environment, the 'green-warming potential' of CH_4 being 25 times more than that of CO_2 and whose quantity increased by 150 times in past 150 years, ocean acidification, reduction in phytoplankton density and primary productivity in seawater due to thermal stratification.

Dr. Gopi also discussed about possibility of disappearance of turtle 'Ariibada' population along Orissa coast, more occurrence/birth of female turtles in comparison to male due to global warming and hindrance of its reproductive compatibility, breeding occurrence of migratory birds and amphibians earlier by 8-10 days and 19-38 days respectively since 1960 and 1970, shift in habitat range of 50% of European birds and butterflies to 20-240km span north towards polar region, shifting of organisms from lower latitudes (sub-tropical level) to temperate range and higher latitudes, erosion of value of biodiversity and restriction and endangerment of endemic organisms, unwinding of global coherence in biodiversity. Surprisingly 3km deep ice blocks in Antarctica have started melting on account of global warming.

The second Lead Lecture was presented by Dr. M. K. Das, Former Principal Scientist, ICAR-CIFRI, Barrackpore on 'Impact, vulnerability and resilience of fisheries to climate change in India'. According to Dr. Das, climate change will compound the anthropogenic stress on aquatic ecosystems, aquatic habitats will alter, dissolved oxygen content will decline, salinity and eutrophication will undesirably increase. He explained that in rivers Cauvery and Narmada, increased rainfall did not necessarily increase river run-off. As an effect of global warming, geographic shift/migration of warmwater Gangetic fishes *viz. Glossogobius giuris*, *Xenentodon cancila*, *Puntius ticto*, *Mystus vittatus* has occurred to the colder stretch of Haridwar, where the mean annual mininum water temperature has increased by 0.99°C. Distributional shift of plankton occurred in inland waters, increase in salinity in Krishna estuary downstream of Prakasam barrage from 20ppt to 35ppt, decline in salinity occurred in Hooghly-Matlah estuary at Diamond Harbour, which is now only

1ppt. Invasive alien fishes have invaded aquatic ecosystems; *Cyprinus carpio var communis*, *Tilapia nilotica*, *Clarias gariepinus* are now constituting 18-25% of the catch in river Yamuna at Agra-Mathura stretch, our indigenous fish species have been subdued there but domination of exotics have occurred. Same is the situation in river Damodar.

Dr. Das discussed about periphyton-based climate-friendly aquaculture, experiments on physiological responses in *Labeo rohita* subjected to sub-lethal temperature rise, resulting in increase in blood cholesterol, haemoglobin, decrease in blood estradiol and inhibited vitellogenesis. Distributional boundary extension has occurred for marine fishes *Sardinella longiceps* and *Rastrelliger kanagurta*; fishermen can now catch *R. kanagurta* (mackerel) in 22-70mts ocean depth zone, which was not possible earlier. In one way, this warming-up of earth and rise in water temperature have proved beneficial of the fact that: in recent years, the phenomenon of maturing of Indian Major Carps in broodstock ponds and subsequently spawning as early as March has been observed in aquaculture hatcheries of major fish breeding and seed production states. An extended breeding period of IMC and its advancement are witnessed. IMC reared in aquaculture systems grew significantly faster at 34°C than at 32.5°C. At Nagaon District in Assam and North 24 Pgs in WB, for IMC, in majority of the cases, onset of breeding has been observed to advance to early-March. Quantitative analysis of temperature data exhibited an increase in temperature in successive months of March and April during years 1970 to 2010. Specifically, there was a sharp increase in March temperature after 1995.

Analysis of temperature data (1999-2009) during the maturing and breeding months of IMC *i.e.,* January-April and May-September from two districts North 24 Pgs and Bankura in WB, indicate that the mean min^m water temperature has increased and higher temperature is witnessed during colder months. Data collected from fish hatcheries indicate that during 1980, breeding of IMC started during the last week of May, whereas during recent years 2005-2008, breeding programmes in the hatcheries were initiated during mid-April. As a result, an extended breeding period of IMC by 40-60 days with breeding season extending from 110-120 days (before 1980-1985) to 160-165 days (during 2000-2008) is evident in fish hatcheries in the two districts.

But during the drought prevailing in WB in 2009, the deficit in rainfall was 25% and 37% during the fish breeding months in two districts respectively, compared to previous years. Breeding commenced in the month of March but, on account of collapse/irregular pattern of monsoon, drought conditions and due to the water scarce situation in fish ponds, total numbers of successful days of fish breeding were restricted to 98 during 2009 in comparison to 150-155 days in previous years. Dr. Das explained all the facts comprehensively.

The third Lead Lecture was presented by Dr. U. K. Sarkar, Principal Scientist, ICAR-CIFRI, Barrackpore on 'Climate change – Impact on inland fish diversity and fisheries'; with highlights on major findings of the ongoing NICRA project on 'Assessment of spawning behaviour of major fish species in inland environment with a view to harness the beneficial effects of temperature'. Dr. Sarkar stated the updated figure on fish biodiversity in India (936 freshwater, 113 brackishwater and 1887 marine), discussed the effects of warmed water temperature on fishes, fish species found in middle of Ganges also recently recorded from foothills of the Himalayas, domination of exotic fishes in natural waters, shift in distribution of catfish *Pangasius* sp from Farakka region in WB to favourable regions, reduction in availability of IMC at Allahabad and Varanasi regions in the Ganges and flourish of common carp and Tilapia therein, region-specific changes in breeding periodicity of fishes in Ganga, fishes (IMC, *Liza parsia*, *Tor putitora*) showing extended breeding season, shifting of breeding season for *Mastacembelus armatus* and catfishes *Eutropichthys vacha*, *Ompak bimaculatus*, *Mystus cavasius*, *M. tengara*, reduction in age at first maturity for female rainbow trout which is undesirable.

One good point, increase in growth has been observed for commercially-important cold water fishes due to increase in temperature. Dr. Sarkar also discussed about predictive models developed on reproductive traits of fishes in relation to climate variability (3D Model Linear developed for breeding periodicity of *Channa punctatus*), assessment of carbon sequestration in selected aquaculture-centred wetlands; more conversion of atmospheric carbon into blue carbon in 0-30cm depth zone than 0-15cm depth, 'hsp-70' protein in liver and serum cortisol showing higher expression in fishes in slower temperature increment than faster temperature increment, sperm DNA fragmentation occurring at higher temperature; in wetland/beel fishes, females have been found to mature but milts in male fishes are getting diluted and not potential enough to fertilize eggs, thus inhibiting reproduction and natural recruitment. In the end, Dr. Sarkar commented on enclosure-based fish culture in cages and pens in wetlands as a tool for climate change

adaptation, and deep pool and weed refuge based fishery in wetlands/beels where water depth is less. The entire programme was nicely coordinated by Dr. P. Bandyopadhyay, Dr. D. Nath and Dr. A. Panigrahi, Professors at Department of Zoology, Kalyani University. ❐

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Zika Virus: What is the Current Status?

Zika virus (ZIKV) is a Flavivirus spread by infected *Aedes* mosquitoes. Although the virus has been known since 1947, it hit the headlines in 2015 with major outbreaks in Brazil and other Latin American countries as well as the Caribbean. Cases of microcephaly, in which babies are born with abnormally small heads, were reported in large numbers and sent the public health systems into a flurry of activity in these countries. The situation worsened so much that the World Health Organization (WHO) in February 2016 declared ZIKV to be a Public Health Emergency of international proportions.

Although ZIKV is primarily spread by the bite of infected mosquitoes, it has been reported to be spread through blood transfusion as well as sexual contact. Most people infected with ZIKV develop mild or no symptoms. Those who do develop symptoms, usually exhibit fever, joint pain, muscle pain, rash, conjunctivitis, and general fatigue. The disease usually resolves by itself within a week. However, the emergence of complications like microcephaly through infected pregnant mothers, has stimulated intense research in a bid to increase our understanding of this unassuming virus. Indeed, studies have shown that the transplacental transmission of the virus occurs in the first trimester of pregnancy. It is now believed that microcephaly could just be the "tip of the iceberg", as with further research, it is slowly emerging that other congenital brain abnormalities also occur. Importantly, Guillain-Barré syndrome is another complication where autoantibodies are targeted against the nervous system, which can cause paralysis, and even death.

The danger of ZIKV lies in the fact that it can be spread to hitherto unaffected areas. The mosquito vector is distributed across the globe in all tropical climes, and this same vector also spreads diseases like dengue and chikungunya, thereby further complicating matters. This, coupled with the phenomenal increase in air travel, can send the virus anywhere across the globe within a matter of 24 hours, where the vector mosquito would be waiting to spread it further. Indeed, this is already happening, as the virus has made inroads to USA as well as other continents. Four cases of ZIKV infection were reported from Florida in July 2016, and on January 25, 2017 the first case of ZIKV infection in a pregnant woman who had never been in any endemic country for ZIKV transmission was reported from the state of Texas, which has reported over 300 cases of illness due to ZIKV so far. As of March 6, 2017, researchers have observed an increased severity of symptoms of ZIKV infection in 1,118 Canadian patients who had returned from ZIKV-endemic countries in Latin America. This finding points to the fact that the virulence of the virus is increasing. Several cases of imported ZIKV infections have been reported from North America, Europe, Asia, and Australia. These cases included infected pregnant women. There have also been reports of sexual transmission of ZIKV from Europe and USA. Although 13 Indians have tested positive for ZIKV antibodies in Singapore, the virus has so far failed to enter India.

Studies have indicated that following the bite of an infected *Aedes* mosquito, the virus is spread from the skin via the draining lymph nodes and blood to the peripheral tissues and visceral organs. However, till date, there are very few cell types for which ZIKV tropism has been established. Experimental studies have mainly focused on the possible implications of placental and neural cells in viral pathogenesis. The neurotropism of ZIKV has been recently established using a mouse model. Research has also concentrated on identifying the host factors involved in the restriction of infection and the development of antiviral immune responses. Several of these host-factors have already been identified. Moreover, genome-wide screenings have identified a number of human genes that are essential for ZIKV replication, and could provide an answer to developing new antiviral therapies.

Vaccine development is complicated by the fact that ZIKV shares cross-reacting antigenic epitopes with other flaviviruses, so that prior exposure to a flavivirus infection could aggravate the immune response against a heterologous antigen. The same problem applies to the development of immunodiagnostics against ZIKV. Nevertheless, several ZIKV vaccine candidates have been developed and are undergoing evaluation in clinical trials. Therefore, 2017 appears to be an exciting year for ZIKV research, and we

might soon see a safe and effective vaccine on the horizon! ❐

Kaushik Bharati, PhD,MIPHA
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DDG (Fisheries Science), ICAR speaks on Priorities in Fisheries and Aquaculture, emphasizing on PM's Vision on Blue Revolution

Our Hon'ble Prime Minister (PM) has stated in his public speech at Somnath town, Gujarat on 8th March, 2017 (and also at the International Agro-Biodiversity Congress, held at New Delhi on 6th November, 2016) that we have to achieve a blue revolution in India, which has to come from fisheries and aquaculture sector and we have to double the income of agriculturists, fishermen and fish farmers, bring in prosperity for them. Foreseeing the high potential in fisheries sector, PM has called for this Blue Revolution or the Neel Kranti Mission. Its vision, which has been given by the PM in 2016, is to achieve economic prosperity of the country and the fishermen and fish farmers, as well as contribute towards food and nutritional security through full potential utilization of water resources for fisheries development in a sustainable manner, keeping in view the bio-security and environmental concerns.

In the recently-completed National Seminar on 'Priorities in Fisheries and Aquaculture', organized at College of Fisheries (under Orissa University of Agriculture and Technology), Rangeilunda, Dist. Ganjam, Odisha during March 11-12, 2017, Dr. J. K. Jena, DDG (Fisheries Science), ICAR in his Presidential Address elaborated on PM's vision and explained different options for fulfilling it. He gave thrust to 'Quality and Cheap Fish for All, Forever'; identifying and knowing different issues in fisheries and aquaculture sector, setting up strategies to tackle them, fixing up a goal and then setting up the prioritization directives. Three decades back, our target was to intensify and increase foodfish production, mainly of farmed/cultivable fishes but now, in addition to it, we have to double income of farmers, *i.e.,* provide more income/ money to them. Dr. Jena further mentioned that prioritization should be given not only in research, but also in other aspects; he commented on production of good quality fishes, conservation of aquatic resources, tackling environmental concerns (if any) arising out of aquaculture practices, eradication of poverty and hunger, providing good health to everybody *via* supply and consumption of nutritious and healthy fishes.

Dr. Jena expressed concern over competition of aquaculture sector with other farming sectors on fish meal and soyabean meal as fish feed ingredients; emergence of IMNV (Infectious Myonecrosis Virus) disease in shrimps since last six months (that had no occurrence 25 years back); prevalence of opportunistic fish pathogens along with unauthorized entry of exotic fishes in natural waters; development of anti-microbial resistance in fish pathogens; flourish of hybrid fish seeds; shrunken riverine living resource and deterioration of water quality; diminishing numbers of backyard kitchen-ponds in villages; deterioration of bottom soil in perennial fish ponds on account of intensive fish farming, usage of chemicals, feed and fertilizers unjudiciously; issues like juvenile fishing and ghost fishing in inshore waters; likely decrease in fish production level by 10% in open waters along with increase in temperature by 1% (due to global warming).

Dr. Jena commented on developing strategies to bring open water resources into our hold; reservoirs as sunrise sector in inland fisheries development; analyzing the potential of mariculture practices as 'blue economy'; prioritization on 'more crop per drop' concept, water budgeting, efficient water utilization, reuse of water in aquaculture practices; strategies to be formulated in Odisha to produce 40 crores of fish fingerlings in sufficient pond area in the state, which is deficit, and to be self-sufficient; proper identification of source of fish seed and parent seed stock of 4-5 generations back in fish hatcheries and farms; level of back crosses, managing effective population size; proper quarantine facilities in hatcheries and implementation of bio-security measures. According to Dr. Jena, we need to introspect of what we have done and what the country expects from us.

He emphasized on technology dissemination to fish farmers; intensification of disease surveillance programme; increasing fish production with limited human resource and time; more emphasis to be given by ICAR institutes on fish feed technology; increase in quality of manpower and mechanization; use of non-conventional bioresources to save energy cost; precautions to be taken by farms in producing fish and vegetables, availability of farm produce and organic fish in supermarkets; 'Green fishing' concept; fish fingerling/juvenile ranching programme in inland and marine waters; use of fish aggregating device; introduction of 'catch quota' concept among professional fishermen; knowledge-based production system and bringing more

knowledge into farm production system; introduction of National Fisheries Policy; fish stock assessment in inland open water bodies (as like marine sector); identification of potential fishing zones; generation of new information from fish genomics, proteomics, transgenesis; possibility of production of marine foodfish tuna from mackerel, high-valued murrel from *Channa gachua* or from other murrel species, ornamental fishes from *Labeo rohita* or other fishes, all of which may become possible by the 'surrogation' technology. In this connection, Dr. Jena mentioned the name of Dr. S. K. Majhi, Sr. Scientist at ICAR-NBFGR, Lucknow, working in this field. Dr. Jena opined about 'joining hands' and bringing in synergy among Scientists in different ICAR institutions on fisheries and aquaculture, looking into convergence and synergy in research ideas and synthesizing them, forming research network – the information generated from this system can be made use as a major weapon to reach to people.

Dr. Jena spoke on implementation of appropriate action plan (AAP) to maintain the growth of fisheries and aquaculture sectors and which will help aquaculture, an important and highly-productive agricultural activity, to reach to newer heights. He discussed about proper prioritization of available resources in limited time, money and manpower; fish farmers and consumers as clientele of fisheries sector; we must join hands and move ahead in the midst of many hurdles; have to confront challenges like climate change and environmental impact upon aquatic resources, pollution, water abstraction, loss of biodiversity, over-exploitation, finite availability of critical inputs, genetic erosion, emergence of new diseases and spread of existing pathogens to new areas – and in this regard an AAP will be very useful, which can tackle such challenges. Fish health welfare and fish farmer welfare are the two major notions we must possess; Dr. Jena further opined that appropriate strategies and AAPs will help in achieving a real Blue Revolution in our country. ❐

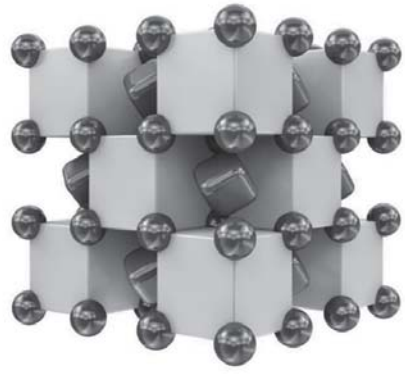
Subrato Ghosh
Fishery Field Assistant
Kushmandi Block, Dakshin Dinajpur

Stable Helium Compound Formed

Helium has been known to be the noblest among the noble gases – a six-member group of elements in the periodic table that do not react easily with other elements. Helium is the least reactive element on the periodic table thanks to its full outer shell. Conventional wisdom states that noble gases cannot interact with other atoms to create stable compounds. However, till recently, except helium all the other noble gases – neon, argon, krypton, xenon and radon – were known to combine with other elements to form compounds. Now helium appears to have joined the same category. Scientists have reported creating what appears to be a stable helium-sodium compound, challenging some of the most basic assumptions of modern chemistry.

Helium is the second most abundant element in the universe, after hydrogen, and makes up a large proportion of stars and gas giants. The element has an extremely stable closed-shell electronic configuration, zero electron affinity and an extremely high ionisation potential. It has been known since the 1960s that the heavier noble gases will, under sufficient pressure, form metastable compounds, but helium has always remained stubborn. Helium can form van der Waals molecules – very weakly bound clusters of atoms or molecules, at extremely low temperatures – but they cannot be sustained for long and are not considered true stable compounds.

The recent breakthrough was predicted by a team led by Artem Oganov of Stony Brook University, New York, USA. They used a 'crystal structure-predicting' computer model that suggested at least two helium compounds are possible – Na_2He and Na_2HeO. Subsequently, researchers from China, Russia, and the United States came together to see if they could make the first of these, using a diamond anvil to apply high pressure. A team led by Xiao Dong, working in the laboratory of Artem Oganov, succeeded in synthesising a sodium-helium compound using a diamond anvil cell to apply the requisite high pressures – about 113GPa (gigapascals), which is more than a million times



Crystal structure of Na_2He: Purple spheres represent sodium atoms, which are inside the green cubes that represent helium atoms; the reddish-brown regions inside voids of the structure show areas where localised electron pairs reside. (Credit: Xiao Dong et al., doi: 10.1038/nchem.2716)

the normal atmospheric pressure (*Nature Chemistry* 6 February 2017 | DOI: 10.1038/nchem.2716).

Diamond anvil cells have been used to study many chemicals under extreme pressure, most recently hydrogen wherein scientists claim to have made its metallic form. The new sodium-helium compound has been shown to be a highly insulating solid – an electride. Electrides are something of a chemical curiosity. They are ionic materials within which electrons act as anions and they find roles in catalysis and as reducing agents in organic synthesis. They have been shown both theoretically and experimentally to exist in several materials at high pressures.

The new helium compound has been hailed as a breakthrough that may change many of our old chemistry assumptions. The team now plans to synthesise a compound of sodium, helium and oxygen, which has been predicted to be possible. According to Oganov, the next step is to make Na_2HeO. This compound, he says, is stable at a very moderate pressure of 15GPa, and if the researchers find a way to lower the pressure to 3-5GPa or so, this compound could be used for storing helium. ❐

Biman Basu
Dream 2047
April 2017, Vol. 19 No. 7

Dangerous Bacteria Turned into Cancer Fighter

Cancer is any malignant growth or tumour caused by abnormal and uncontrolled cell division. The immune system of our body can fight infections because it identifies pathogens as 'foreign' and destroys them. But our immune system cannot destroy cancer cells. This is because, with some major exceptions, cancer cells generally have all of the same antigens as the rest of our cells, so any immune cells that would have been activated by their antigens are not around to react. Several research groups have been looking into the possibility of training our immune system into attacking cancer cells, or cancer immunotherapy.

Salmonella is a rod-shaped anaerobic microbe notorious for causing most cases of food poisoning. Usually, most people get better without treatment. But, Salmonella can cause more serious illness in older adults, infants, and persons with chronic diseases. Recently an international team of researchers led by Jin Hai Zheng, from Chonnam National University Hwasun Hospital in Jeonnam, South Korea have managed to turn this dangerous bacterium into a life-saver by making it infiltrate tumours and marking the cancer cells up to the body's immune defences, making them a target for attack. Of course, the scientists used genetically modified Salmonella, which is a million times less potent than the version of the bacterium that causes food poisoning. In other words, it a very safe strain and does not seem to cause any systemic inflammation or toxicity in internal organs. In trials with mice transplanted with human colon cancer cells, more than half the animals were completely cured without any side effects (Science Translational Medicine 8 Feb 2017 | DOI: 10.1126/scitranslmed.aak9537).

The team discovered the possibility of using Salmonella for cancer immunotherapy accidentally while working on unrelated research in which they noticed that the bacteria that attacked shellfish produced a protein called 'FlaB' that caused a strong immune response. This led them to genetically modify the common Salmonella bacteria so that it, too, would produce the same protein – and stimulate the immune system into action.

It has been known for some time that certain types of bacteria, including strains of Salmonella, are able to grow in cancerous tumours but not in normal tissues. But until now, attempts to use bacteria as anti-cancer therapies have had only limited success, both in the laboratory and in the clinic. The current work by Zheng and colleagues therefore represents a fascinating new approach to using bacteria to fight cancer.

It must, however, be mentioned here that the modified bacteria do not kill cancer cells directly; they only trigger the immune system to mount an attack on the tumour. There have been previous studies that have looked at using bacteria to carry anti-cancer drugs into tumours. But this is the first time scientists have used bacteria to trigger the body's own immune response to combat cancer. Encouraged by the success of animal trials the team is now seeking funding for clinical trials on humans. ❐

Biman Basu
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Harappans Built the Earliest Tsunami-Protection Wall

The Harappans who lived around 5,000 years before present may have been aware of the devastation caused

by tsunami. This has been revealed in a recent study by a group of marine archaeologists of CSIR-National Institute of Oceanography (NIO), Goa at the ancient port town of Dholavira in Kuchchh, Gujarat. Dholavira was the largest port-town of the Harappans, and is the second largest Harappan site located within the present borders of India. According to archaeologists, it was perhaps the best planned Harappan city with several divisions and many new features hitherto unknown. This well-planned urban settlement flourished for about 1,500 years from about 5000 to 3450 BCE.

Archaeological excavations show a unique feature of Dholavira – the presence of a 14-18-metre thick wall, apparently built as a protective measure. The most intriguing feature of the wall is its unusually large thickness. According to the researchers, walls of such thickness are not found even in historic times when the conflicts have been more common and the weapons have become increasingly more destructive. The wall thickness at Dholavira exceeds the functional (protection from Harappan weapons, namely sling shots/bow arrow) and investment (in terms of material and labour involved at the times of limited resources) limits of military protection. Moreover, discovery of gunpowder and its introduction in India was much later than the timing of the Dholavira settlement. There must have been other reasons.

The real purpose of the Dholavira wall has been a topic of considerable debate. After examining the wall closely and surveying a hitherto unexcavated area using Ground Penetrating Radar (GPS) and systematically collecting soil samples, the CSIR-NIO team has come to the conclusion that the thick wall was built to protect the town from extreme oceanic events such as storm surges and tsunamis. Dholavira, being close to the sea could have been vulnerable to oceanic calamities. There is a traditional history of tsunami waves and strong storms hitting the Gujarat coast. The coastal geomorphology of Kuchchh region indicates that inland portions of the coastline have features which amplify the effect of tsunami waves when they get coupled with high tide, thus becoming fatal. According to the scientists, Dholavira site has the first evidence of tsunami-protection wall in the world (Current Science, 25 December 2016 | doi: 10.18520/cs/v111/i12/ 2040-2043).

The remains of the magnificent Northern wall of Dholavira that is believed to have been built as a protection against storm surges and tsunamis.

According to Rajiv Nigam of NIO who led the team, study of oceanography showed that Makkran coast that was close to Bhuj was a highly tsunami-prone area and their research study indicated that the earliest recorded tsunami in the region was about 8,000 years old. The structure of the Dholavira wall is similar to that of 400-kilometre 'sea-wall' that Japan is said to have started last year, although given the use of concrete material these days the width of the sea-wall would be 12 metres, but the idea is the same. It means our Harappan ancestors were aware of tsunami and succeeded in creating a defence to it. ❐

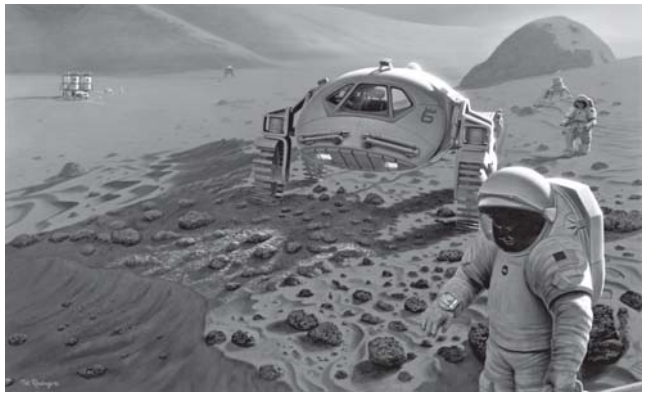
Biman Basu
Dream 2047
April 2017, Vol. 19 No. 7

Trip to Mars may Cause Permanent Brain Damage in Astronauts

In a recent study, researchers at the University of California, Irvine have found that exposure to highly energetic charged particles – much like those found in the galactic cosmic rays that will bombard astronauts during extended spaceflights – causes significant long-term brain damage in test rodents, resulting in cognitive impairments and dementia. It is the second study the team has done to show that cosmic radiation causes permanent and likely untreatable, brain damage. While their experiments involve mice, according to the researchers the brain structures that are damaged are similar in humans (Scientific Reports, 10 October 2016 | DOI: 10.1038/ srep34774).

The study further adds, "Exposure to these particles can lead to a range of potential central nervous system complications that can occur during and persist long after actual space travel – such as various performance decrements, memory deficits, anxiety, depression and impaired decision-making. Many of these adverse

consequences to cognition may continue and progress throughout life."



Recent studies indicate that astronauts may suffer irrepiarable brain damage due to galactic cosmic rays *during extended spaceflights such as those to Mars.*

According to the US space agency NASA, astronauts risk physical damage from the radiation encountered in space. Earth is enveloped in a large, protective sheath called the magnetosphere, which deflects a lot of the ionising radioactive particles that speed through space, significantly reducing the risk for astronauts staying in space stations in near-Earth orbit. Teams aboard the International Space Station are inside that protective envelope so unlikely to suffer any damage. But Moon travellers were not, and according to NASA, a study showed the cosmic radiation may have damaged the hearts of many of the Apollo program astronauts. According to Charles Limoli, who led the UCI study, "Our data provide additional evidence that deep space travel poses a real and unique threat to the integrity of neural circuits in the brain".

A trip to Mars would expose astronauts to even more radiation than during a trip to Moon – enough to cause cancer, for sure, and now this research suggests brain damage, as well. Limoli says, "Such conditions could clearly be problematic for astronauts and their capability to efficiently operate over the course of a deep space mission. Exposure to these particles can lead to a range of potential central nervous system complications that can occur during and persist long after actual space travel – such as various performance decrements, memory deficits, anxiety, depression and impaired decision-making. Many of these adverse consequences to cognition may continue and progress throughout life."

NASA is looking for lightweight and efficient shielding material to protect astronauts from the energetic particles during long space voyages. Conventional shielding materials would be too heavy and would enormously increase the cost of launch. In fact, NASA is currently investigating a handful of possibilities that could be used in anything from the spacecraft to the Martian habitat to space suits. Unless the right shielding material is found, a manned mission to Mars may turn out to be too risky to undertake. ❐

Biman Basu
Dream 2047
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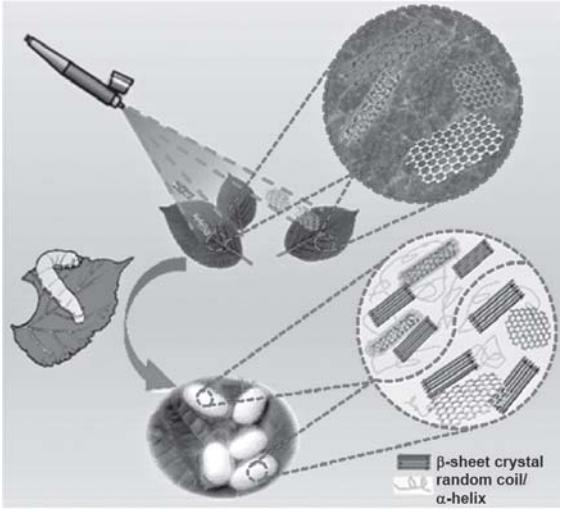
Silkworm Fed with Carbon Nanotubes Produce Stronger Silk

Silk is a natural protein fibre produced by caterpillars of certain moths that can be woven into fabrics. Most silk used for clothing comes from silkworms or moth caterpillars, the larvae of which produce silk to form cocoons. Many other types of insects, including spiders, also produce silk. Silk produced by silkworms is not as strong as spider silk, which is even stronger than steel. But now scientists have found a way to make silkworms produce stronger silk by feeding them carbon nanotubes and graphene (Nano Letters, 13 September 2016 | DOI: 10.1021/acs.nanolett.6b03597).

The study was done by Yingying Zhang and her colleagues at Tsinghua University in Beijing, China, who fed common silkworms *Bombyx mori* a diet of mulberry leaves sprayed with an aqueous solution that contained either 0.2 percent of carbon nanotubes or graphene. According to the researchers, the smaller, 1- to 2-nm-wide single-walled nanotubes they used "are more suitable for



Silkworms fed with carbon nanotubes produce stronger, reinforced silk.

incorporation into the crystalline structures of silk protein". After feeding, the worms produced silk that was twice as strong as traditional silk and could withstand about 50 percent more stress before breaking. The higher strength of the modified silk was due to incorporation of part of the fed carbon nanomaterials. According to Zhang, treating already spun silk would require dissolving the nanomaterials in toxic chemical solvents and applying those to the silk; so the feeding method is simpler and more environmentally friendly. When the researchers heated the new fibres up to 1,050°C they were carbonised and could conduct electricity.

Although there is no doubt that feeding with carbon nanotubes produced stronger silk, the scientists are still not clear as to how the silkworms incorporate the nanomaterials in their silk. Another question that needs to be answered is what percentage of the nanomaterials eaten by the worms makes it into the silk instead of being excreted or otherwise metabolised. According to Zhang, the carbon materials are not visible in the cross-sections of the silk threads, perhaps because the nanoparticle content is low. But Raman spectroscopy and electron microscopy imaging showed that the carbon-enhanced silk fibres had a more ordered crystal structure due to the incorporated nanomaterials. Looking ahead, the scientists hope to better understand the process of how the carbon materials are integrated into the silk thread in order to optimise the amount of supplement that ends up in the finished thread. According to the researchers, this work provides an "easy way to produce high-strength silk fibres on a large scale". The electrical conductivity of the carbon-reinforced silk might make it suitable for sensors embedded in smart textiles and to read nerve signals. ❐

Biman Basu
Dream 2047

January 2017, Vol. 19 No. 4

Excessive Exposure to Digital Media Harmful for Children

Computers, TV, iPad and smartphone are commonplace things in almost every household today. More children, even in economically weaker households, are using newer digital technologies, such as interactive and mobile media, on a daily basis. Many parents are under the belief that technology and gadgets are essential for a child's development and they consider it normal to keep their kids busy watching cartoon channels on TV or handing them smartphones to keep them quiet. TV has been an easy "babysitter" for years now, aided even further with gadgets like the iPad and smartphone.

Recently, the American Academy of Paediatrics has come out with a policy statement and recommendations which outline the potential dangers of excessively exposing young children up to age of 5 years to television, videos, and mobile and interactive technologies. The policy statement addresses the influence of media on the health and development of children up to 5 years of age, "a time of critical brain development, building secure relationships, and establishing health behaviours" (*Pediatrics*, November 2016 | DOI: 10.1542/peds.2016-2591).

The recommendations are based on dozens of studies on screen time and its effect on the emotional and physical health of kids of all ages. They also incorporate evidence about whether young children really do learn from apps and TV shows. Here is a gist of the recommendations:

- Children under the age of 2 should avoid all digital media use except for occasional video chatting.
- If you must introduce digital media to toddlers between the ages of 18 and 24 months, choose high-quality programming and sit with your child. Solo viewing should be avoided.
- Children ages 2 to 5 years should have no more than one hour exposure to screen a day.
- Keep bedrooms, mealtimes and parent-child playtime free of screens.
- Children of all ages should avoid exposure to devices and screens for one hour before bedtime.
- Keep smartphones, TVs and other devices out of the bedroom. ❐

Biman Basu
Dream 2047

January 2017, Vol. 19 No. 4

Elusive Triangulene Synthesised After Six Decades : A Unique Feat by Non-chemists

Conjugated hydrocarbons, to which classical (benzene-like) Kekulé structures can't be assigned, are known as non-Kekulé hydrocarbons. They have two (or more) formal diradical centres whose spins, since aligned, can't

be paired up but cause ferromagnetism (electrical conductivity) in this type of molecules. As one may expect, these diradical molecules are highly reactive and, immediately after synthesis, undergo decomposition by polymerisation or oxidation. Their lies the difficulty in synthesising unsubstituted non-Kekulé hydrocarbons.

One special class of these compounds comprises non-Kekulé *p*olynuclear *a*romatic *h*ydrocarbons (PAHs) which are composed of several fused six-membered rings. In 1953, Erich Clar hypothesised (E. Clar *et al.*, *J. Am. Chem. Soc.*, 1953, **75**, 2667) the existence of the simplest member of non-Kekulé PAHs, viz. triangulene which is also known as Clar's hydrocarbon. This flat, biradical molecule, $C_{22}H_{12}$, is composed of six carbon hexagons (including four benzenoid rings) joined along their edges to form an overall triangular shape, hence the name. Two of the outer carbon atoms contain unpaired electrons (Fig. 1).

More than six decades ago Eric Clar tried to synthesise triangulene, but without success. Although two different stable derivatives of triangulene were synthesised later by Bushby (1995) and Nakasuji (2001), the synthesis of the parent molecule eluded until recently. In a collaborative project between the University of Warwick, Coventry, U.K. and IBM Research-Zürich, Switzerland, Pavlièek *et al.* synthesised triangulene using, so to say, molecular surgery at the tip of microscope (N. Pavlièek, A. Mistry, Z. Majzik, N. Moll, G. Meyer, D.J. Fox and L. Gross, *Nat. Nanotech.*, 2017, **12**, 308; doi:10.1038/nnano.2016. 305).

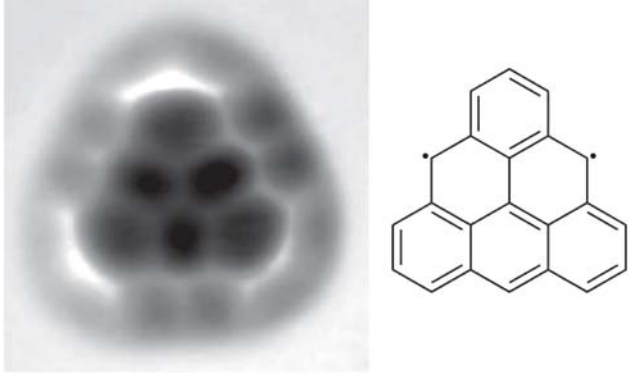


Fig. 1: Triangulene (**1**)

The precursor molecule **2** (structure not shown), a dihydrodibenzo[*cd*,*mn*]pyrene, was prepared from *o*-bromotoluene in seven steps by Anish Mistry and D.J. Fox of the Department of Chemistry, University of Warwick. This dihydrotriangulene was essentially a 3:1 mixture of two non-equivalent isomers – the major isomer containing an aromatic benzo[*c*]phenanthrene core and the minor isomer containing a 9-phenylanthracene core. Dihdrotriangulene was deposited on Cu(111), Xe(100) and NaCl(111) surfaces and dehydrogenated at the tip of combined scanning tunnelling microscope/atomic force microscope (STM/AFM) at the IBM laboratory.

Compound **2** was evacuated and sublimed in a two-step procedure. Firstly, directly after synthesis, **2** was filled into a tantalum crucible, inserted into an ultra high vacuum (UHV) chamber and evacuated to $> 10^{-4}$ mbar. The entire process from synthesis to evacuation was done in < 30 min to minimise oxidation. In the second step, **2** was sublimed from the crucible to a mobile evaporator ($P \approx 10^{-8}$ mbar) in the UHV chamber, the evaporator then introduced into the STM chamber ($P < 10^{-10}$ mbar) and the compound deposited onto the cold (< 10 K) sample, placed at the microscopic tip, by flash sublimation. Two successive voltage pulses were then applied at the tip, carefully positioned above molecules **2**, to cleave off two hydrogen atoms to generate the biradical species of triangulene. Under the UHV and low temperature conditions of the experiment, triangulene was quite stable during the studies.

The STM measurements coupled with DFT (density functional theory) calculations confirmed that triangulene behaves as a free molecule on the surface, whereas the AFM measurements resolved the planar, threefold symmetry of its molecular structure. Additionally, the DFT calculations of triangulene adsorbed on a monolayer Xe on Cu(111) confirmed its triplet-ground state character. The elusive triangulene – the smallest triplet-ground state polybenzenoid – was thus finally synthesised, albeit not by chemists but by atomic manipulators.

Because of the magnetic orientation of this class of biradical species with aligned spins, triangulene has potential applications in quantum computing, quantum information processing and spintronics, in which electron spins are manipulated to encode and process information. ❐

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Global March for Science on Earth Day (April 22, 2017)

Saturday, April 22, 2017 witnessed an unprecedented global support to science. A series of rallies and

Fig. 1

Fig. 2

Fig.3

Science is Everywhere sticker

March for Science Philadelphia stickers

Fig. 4

marches were held in Washington, D.C., USA and in around 600 other cities in the USA and other countries across the globe on this 'Earth Day'. Hundreds of scientific organizations of the USA, including the American Association for the Advancement of Science (AAAS), endorsed the march. According to the organizers, the march was an apolitical and a non-partisan movement to celebrate science and to safeguard the interests and roles played by the scientific communities in everyday lives and against the hostile policies of the Trump administration to science. It also aimed to bring the public closer to scientists and their research. As per the website of the march, "*American government that ignores science to pursue ideological agendas endangers the world*." According to Robert N. Proctor, a historian of science at Stanford University, the March for Science was "*pretty unprecedented in terms of the scale and breadth of the scientific community that's involved*" and is rooted in "*a broader perception of a massive attack on notions of truth that are sacred to the scientific community*." The logo (Fig. 1) used for this March for Science and some (Figs. 2-4) of the numerous buttons sold therein are shown below.

In Washington, thousands of scientists, their families and friends and even members of the public gathered at the Capitol Hill (Washington Monument) and marched shoulder-to-shoulder on the Constitution Avenue, calling upon the public to stand up for the cause of science. They defied the rainy sky and drizzles and chanted variously like "*Save the E.P.A.*", "*Save the N.I.H.*", "*What do we want? Science! When do we want it? After peer review!*", etc. – all in favour of science. As stated by one doctoral student of Columbia University, "*The march is allowing the public to know that this is what science is, and it's letting our legislators know that science is vitally important.*"

At least 0.1 million people, it is claimed, participated in the Washington march. In other cities of the USA and other countries of the globe, dozens to hundreds to thousands of protesters participated in the March for Science. According to *ScienceInsider*, an estimated 0.5-1.0 million people took part in the global march. Organizers said they hoped the day's demonstrations result in sustained, coordinated action aimed at persuading elected officials to adopt policies consistent with the scientific consensus on climate change, vaccines and other issues.

Some remarkable participants include only 3 researchers in North Pole (NASA Climate Research), 6 people in Ho Chi Min City, Vietnam, 7 scientists in Neumayer-Station III, Polar and Marine Research, Antarctica, some 20 people in Kangerlussuaq, Greenland, about 40 scientists in the research village Ny-Ålesund, Svalbard Island, Norway located in the Arctic Ocean and a small group of students around Sher-e-Bangla Agricultural University, Dhaka, Bangladesh. In India too, marches were scheduled (held?) in two cities, viz. Coimbatore and Hyderabad. Arjhun Swaminathan of School of Science said, "*We here at Coimbatore are marching to bring a new era in science education in the city.*"

The posters that the marchers carried contained a variety interesting slogans, some of which are: "Fund science, not walls", "Keep your tiny hands off my science", "Smart science, not dumb cuts", "Science, not silence", "Science Trumps ignorance", "Science matters", "Science creates the future", "Scientific evidence is true, whether you believe it or not", "Science facts rule, alternative facts drool", etc.

The March for Science was triggered by the alarming attitude of the U.S. President Donald Trump and his administration to and action against science, scientists and scientific activities. As early as 2012 and repeatedly thereafter, Trump has referred to climate change and global warming as a 'hoax', promised to pull out of the 'Paris Agreement' and withdraw numerous environmental protection laws. He also cast suspicion on the safety of vaccines. In March this year (2017), the Trump administration proposed in the budget major funding cuts to premier agencies like, *inter alia*, the Environmental Protection Agency (EPA), the National Institutes of Health (NIH), National Oceanic and Atmospheric Administration

(NOAA), Department of Energy (DOE), U.S. Geological Survey, etc. A gag order on the EPA scientists regarding the dissemination of their research findings has worsened the situation.

A few days before the global march took place, a survey was made over more than 1,000 members of the March for Science facebook groups to find out their motivation for joining the march. The survey revealed that the major motivations were (i) 'to encourage public officials to make policies based on scientific facts and evidence' (97%), (ii) 'to oppose political attacks on the integrity of science and 'to encourage the public to support science' (93%) and (iii) 'to protest cuts to funding for scientific research' (90%). Not surprisingly, 'to become more involved in politics or policy-making' transpired to be the motivation for nearly half (45%) of the respondents. ❐

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George Andrew Olah, N.L., Father of Carbocation Chemistry Died

The illustrious Hungarian-American chemist G.A. Olah, the winner of Nobel Prize in Chemistry in 1994, the Father of Carbocation Chemistry, the developer of the concept of Superelectrophiles and the proponent of the 'Methanol Economy' breathed his last on March 8 this year at his residence in Beverly Hills, California, USA at the age of 89 years.

George Andrew Olah

He was born (Hungarian name: György Oláh) to Gyula Oláh, a lawyer and Magda Krasznai in Budapest, Hungary on May 22, 1927. He had his early education in the high school of Budapesti Piarista Gimnazium. Strangely, Olah showed little interest in chemistry in his formative days. Olah himself said, "My main interest was in the humanities, particularly history, literature, etc. I was (and still am) (an) avid reader and believe getting attached too early to a specific field frequently short-changes a balanced broad education." So he followed a curriculum that put emphasis on humanities, particularly Latin and obligatory German and French. Indeed, later in life, Olah used to be known in academic circles as a 'Renaissance Man' because of his deep knowledge in Arts, Science and Culture.

During his graduate studies in chemistry at the Technical University, Budapest (now known as the Budapest University of Technology and Economics), he came in contact with the organic chemist, Géza Zemplén, when he appears to acquire interest in Chemistry. He earned his B.S. (1945) and Ph.D. (1949) degrees, both in Organic Chemistry, from this University. In 1949, Olah married Judith Agnes Lengyel, a technical secretary at the University, whom he had known since his early youth. Judith also studied chemistry and later joined the research group of George Olah. Olah started his professional career as an Assistant Professor in Organic Chemistry at the Technical University, Budapest in 1949. He then joined the Hungarian Academy of Sciences (1954-1956) where he was the Head, Department of Organic Chemistry and Associate Scientific Director of the Central Research Institute.

In 1956, there was a Soviet military crackdown on the Hungarian uprising. Later this year around 2 Lakh Hungarians fled their country, and Olah, his wife, his newborn son George (1954) and much of his research group were amongst them. After a brief stay in England, he and his family, along with a fellow Hungarian chemist, Stephen J. Kuhn, moved to Canada. There he joined the Dow Chemical Company in Sarnia, Ontario in 1957. Dow Chemical established a small research laboratory at Michigan, USA. Here at Dow, Olah started his pioneering work on carbocations and continued till 1964.

In 1965, Olah returned to academia – he joined the Western Reserve University, Cleveland, Ohio, USA first as a Professor and the Chairman, Department of Chemistry (1965-1967), then as Chairman, Combined Departments of Chemistry, Case Western Reserve University (named after merger with neighbouring Case Institute of Technology) (1967-1969) and later as the C.F. Maybery Distinguished Professor of Research in Chemistry (till 1977). Olah became a naturalised citizen of USA in 1971. In 1977, he moved to the University of Southern California, Los Angeles where he held several positions, finally becoming

the Director of Loker Hydrocarbon Research Institute (1991-till death).

Carbocations play an important role at intermediate stages in reaction mechanism. But until Olah's work, carbocations were believed to be fleeting (appearing and disappearing in less than a billionth of a second), charged chemical species too unstable to be even characterised. At the beginning of the 1960s, it was Olah who stabilised carbocations using what he called 'Magic Acids' or 'Super Acids' (e.g. FSO_3H-SbF_5) which are enormously stronger than standard strong acids such as conc. sulphuric acid. As a result, carbocations can now be characterised by Infrared and NMR spectroscopic studies and can be used as catalysts in organic synthesis. Olah's work also lent credence to the 'non-classical carbonium ions' since NMR spectroscopic studies on stabilised ions of this type established their cationic character being delocalised over several bonds. Olah also developed the concept and study of 'Supereletrophiles'.

Olah's post-Nobel research was focused mainly on what he called '*the Methanol Economy*'. He believed that the problem of dwindling fossil fuel resources and extant global climate change can be overcome by using methanol as an alternative, renewable source of energy. He suggested that methanol could be produced from hydrogen gas and carbon dioxide (obtainable from industries and atmosphere) using energy (required to generate the hydrogen needed for methanol production) from a renewable source, viz. safe nuclear power plants, sunlight, wind and geothermal sources.

Olah received more than two dozens of other prestigious awards, some of which are Henry Morley Medal (A.C.S., 1970), F. A. Cotton Medal (A.C.S., 1996), Order of the Rising Sun (2003), Priestley Medal (2005) and Hungarian Order of Pro Merit (2006). He also became a Member/Fellow of Japan Society for the Promotion of Science (1974), US National Academy of Sciences (1976), Hungarian Academy of Sciences (1990), The Royal Society, UK (1997), etc. Olah has authored/co-authored many books, viz. *Superacid Chemistry (1985), Hydrocarbon Chemistry (1989), Nitration (1989), Superacids in Organic Synthesis (1998), A Life of Magic Chemistry (2001) (autobiography of Olah), Beyond Oil and Gas: The Methanol Economy (2006), Superelectrophiles and Their Chemistry (2007), etc.* Olah also received honorary Doctor of Science degrees from, *inter alia*, the University of Sopron, Hungary and the University of Munich, Germany. Olah has nearly 1,500 scientific publications and owned more than 100 patents from seven countries, including four for the transformation of natural gas into gasoline-range hydrocarbons.

George Olah is survived by his wife, their two sons: George John Olah, Jr., MBA (b. 1954) and Ronald Peter Olah, MD (b. 1959), two daughters-in-law: Sally Olah and Cindy Olah, two grandsons: Peter Olah, BS and Justin Olah, and a granddaughter, Kaitlyn Olah.

The sad demise of Olah has been mourned by the global community of scientists. The President of the University of Sothern California said: *"Distinguished Professor George Olah was a true legend in the field of chemistry. His pioneering research fundamentally redefined the field's landscape and will influence its scholarly work for generations to come."* G. Surya Prakash, a former Ph.D. student, later a colleague of Olah and currently the Director of Loker Hydrocarbon Research Institute, USC said: *"The chemistry George did was very original, but on top of that, he was a very kind and generous man. In addition to bringing great credit to the chemistry department, he was one of the original pioneers who made this a great university. He brought scientific excellence and creativity to USC."* A press release from the Friends of Hungary Foundation noted: *"With his passing, not only Hungary, but the entire scientific world, and in fact the world as a whole, have lost a true luminary."* ❐

Professor Manas Chakrabarty, FRSC
Formerly, Department of Chemistry
Bose Institute, Kolkata

INSA YOUNG HISTORIAN OF SCIENCE AWARD – 2017

CALL FOR NOMINATIONS

INSA Young Historian of Science Award is instituted by Indian National Science Academy, New Delhi with the aim of recognizing young historians of science of extraordinary promise and creativity who have made notable research contributions in areas relating to History of Science. This award, considered to be the highest recognition of promise, creativity and excellence is made annually to those historians of science who are distinguished for these attributes as evidenced by their research work carried out in India or abroad. Only those born on or after **January 1, 1982** are eligible for consideration in the year 2017.

The awardee shall receive a **certificate**, a **bronze medal**, cash award of **Rs. 25,000/-** and a seed amount to initiate research project and further scope for overseas training for advancement of career.

A candidate is to be nominated by a Fellow of the Indian National Science Academy and other National Scientific Societies, Vice Chancellors of Universities and Heads of Research Institutions.

Nomination proforma may be availed from Assistant Executive Director at e-mail ijhs@insa.nic.in or be downloaded from website **www.insaindia.res.in.** One hard copy and a soft copy (in MS Word only) of the nomination duly filled in, along with all supporting documents, must reach the Academy latest by **June 30, 2017**.

THE INDIAN SCIENCE CONGRESS ASSOCIATION

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Nominations / Application in prescribed forms are invited from Indian scientists for following Awards :

Asutosh Mookerjee Memorial Award
C.V. Raman Birth Centenary Award
Srinivasa Ramanujan Birth Centenary Award
Jawaharlal Nehru Birth Centenary Awards
M.N. Saha Birth Centenary Award
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H.J. Bhabha Memorial Award
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Vikram Sarabhai Memorial Award
B.P. Pal Memorial Award
M.K. Singa1 Memorial Award
Jawaharlal Nehru Prize
Millennium Plaques of Honour
Excellence in Science and Technology Award
R.C. Mehrotra Memorial Life Time Achievement Award
B.C. Guha Memorial Lecture
Raj Kristo Dutt Memorial Award
G.P. Chatterjee Memorial Award
Professor Hira Lal Chakravarty Award-Plant Sciences
Prof. Archana Sharma Memorial Award-Plant Sciences
Dr. V. Puri Memorial Award-Plant Sciences
Pran Vohra Award-Agriculture and Forestry Sciences
Professor Umakant Sinha Memorial Award-New Biology
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Prof. K.P. Rode Memorial Lecture-Earth System Sciences
Dr.(Mrs.) Gouri Ganguly Memorial Award for Young
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Prof. G.K. Manna Memorial Award-Animal ,Veterinary and Fishery Sciences
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Prd. S.S. Katiyar Endowment Lecture - New Biology/Chemical Sciences
Prof. R.C. Shah Memorial Lecture-Chemical Sciences
Prof. William Dixon West Memorial Award-Earth System Sciences
*Asutosh Mookerjee Fellowship
**Infosys Foundation ISCA Travel Award

***Last date 15th July, 2017; ****Last date 15th November, 2017**

Last date of Receiving of Nominations *I* Application for different ISCA Awards and Lectures of 2017-2018 is **July 31, 2017.** For proforma of application forms and necessary information, please write to the General Secretary (Membership Affairs). The Indian Science Congress Association, 14, Dr. Biresh Guha Street, Kolkata-700 017, E-mail :iscacal@vsnl.net. The form also can downloaded from- http://www.sciencecongress.nic.in

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