

Dr Subhas Mukherjee's Memory Revisited: Professor Sunit Mukherjee Honored with NuTriConf 2

An Indian citizen at the time of receiving the Nobel Prize for works done in India is rarity and it is all the more true when it comes to Physiology or Medicine. The faint India connection started with Ronald Ross (1857-1932) being awarded in 1902 and continued with India born Har Gobind Khorana (1922-2011) awarded in 1968, but the story could have been different as Dr S N Dey (1915-85) and Dr Subhas Mukherjee (1931-1981) missed it narrowly. In the latter instance, it is terribly tragic one as despite being the discover of IVF, Dr Subhas Mukherjee had to take his own life being almost driven towards that by his contemporary jealous colleagues, being a victim of the notorious Bengalee Crab Syndrome like his research mentor Professor Sacchidananda Banerjee, and eventually R Edwards got Nobel Prize in Physiology or Medicine in 2010 for the development of in vitro fertilization. The closest collaborator Dr Subhas Mukherjee, Professor Sunit Mukherjee almost single handedly fought insurmountable odds to restore the honor of his friend and succeeded to a great extent. Professor Mukherjee, a chemical engineer by training including that also from Cornell, served as a Professor at Jadavpur University, Kolkata and carried out his own passionate research directed among other things towards addressing the challenges of nutritious food production.

Department of Food and Nutrition and SHE (Safety, Health and Environment) initiative, West Bengal State University on September 6, 2019 organized a day long academic Conference NuTriConf 2, to honor Professor Sunit Mukherjee for his lifelong contribution to the cause of Nutrition and also for science and society in general. The conference was organized in the month of September 2019, which is declared as the POSHAN MAAH ie Nutrition Month by GoI as a part of its POSHAN (PM's Overarching Scheme for Holistic Nourishment) Abhiyan.

In the morning inaugural session, the students and teachers of the Department of Food and Nutrition extended a welcome to the dignitaries present that included the Vice Chancellor of the University, Professor Basab Chaudhuri,

other senior officials, teachers from other related departments, key office bearers of collaborating partner and associate partner - Society for Nutrition and Dietetics and Nutrition Society of India, Kolkata Chapter respectively, with conference kit, Uttariyo and saplings. In his welcome address, Dr Shankarashis Mukherjee, Convener NuTriConf 2 extended a formal welcome, to the picturesque precincts of the university having synergistic existence of biodiversity reach water bodies and high-rise buildings, to close to 300 participants present. Dr Mukherjee explained that the idea was to create a forum to see that saplings grow into plants, into *new trees* with canopy and canopy closure, appearance of flowers and fruits attracting birds to have nests and the next generation to come up with new ideas which *converge* through discourses, deliberations, discussions and even academic debates. And it was the second such academic convergence - the first endeavor taking place in January 2019, and definitely there has been scaling up in all senses in NuTriConf 2. In the context it was mentioned that the buds started appearing as there have been close to 2.4 times increase in students enrolment in the subject at UG level in affiliated colleges and also in the University PG department. The PG programme syllabi have also been thoroughly revised taking into consideration formally input from industry – both public and private sector – for increasing the skill set and engagement opportunities in different sectors including research, self-entrepreneurship and so on. The endeavors like this were facilitating both dissemination of knowledge and creation of new knowledge. The Secretary SND, Paramita Das Dutta, Senior Dietician, spoke immediately after the welcome address on the objectives and activities of the society, the collaboration, and significance of Nutrition month.

Then in the most important and awaited event of the day, Hon'ble Vice Chancellor Professor Basab Chaudhuri, himself a distinguished scientist, led the University community in honoring Professor Sunit Mukherjee for his lifelong contributions with a shawl and personalized memento; the members of the audience gave the legendary teacher - researcher and above all a gentleman extraordinaire a standing ovation spontaneously, and delivered his address in his usual inimitable style *inter alia* explaining the reasons for according the honor to Professor

Mukherjee mentioning the significant contributions made by Professor Mukherjee along with Dr. Subhas Mukherjee and Dr. Saroj Kanti Bhattacharya in birth of the second test tube baby of the planet – Durga (Kanupriya Agarwal) through the IVF process in 1978, and also his various innovative interventions targeted to alleviate malnutrition. In the context, in his unique style he explained the significance of collaborations and drawback, demerit and even dangers of its absence at its worst form. Professor Chaudhuri also explained to the young participants the significant contribution of Professor Sunit Mukherjee in development of IVF technology and the about Edwards from UK receiving the Prize in 2010.

In his acceptance speech, delivered remaining standing, nonagenarian Professor Sunit Mukherjee mentioned that it was first such honor being accorded to him for his lifelong contributions and not just being limited to his association with Dr. Subhas Mukherjee's immortal discovery. Professor Mukherjee briefly touched upon his numerous contributions in developing nutritious foods like corn flakes of high quality, par boiled wheat, product from rotten cabbage and other vegetable wastes and like in industrial units by using his chemical engineering training in a mode that is now known as the University Industry partnership. Dr. S. Nath, noted oncologist delivered the Keynote address on Food Habits and Cancer Prevention in a lucid and interesting manner with slides that generated a series of enquiries from the members of the audience including that from the Hon'ble Vice Chancellor remaining present in the audience.

Post lunch, in the oral presentation session, chaired by B Basak, President, Nutrition Society of India Kolkata Chapter a series of papers from young pre-doc and post-doc researchers of Jadavpur University, University of Calcutta, ICMR NICED, host West Bengal State University, and from young teachers - of colleges affiliated to different universities - pursuing post-doctoral research, and a registered dietitian were presented; at the end, the discussion was summarized by the session chair and certificates of presentation were provided. A concurrent poster session was held during lunch, wherein a large number of posters were presented by mostly young researchers in PhD programme and also some posters were displayed by UG and PG students. There were lively interactions taking place on different aspects of clinical nutrition - with a large number senior dietitians working in hospitals, registered dietitians remaining present - with the participants and even with the legendary Professor Sunit Mukherjee who remained present throughout the day long

conference.

On the sidelines, there were discussions, in the context of honoring Professor Subhas Mukherjee, involving the participants on the significance of having true culture of research, research lineage and research school, trans disciplinary research with classical examples of a lineage involving Acharya Prafulla Chandra Ray (1861-1944), Chemist, entrepreneur and person of social commitment, and the First Palit Professor of Chemistry at University of Calcutta in 1920s. Bires Chandra Guha (1904-62), founder Professor of Applied Chemistry in University of Calcutta at Rajabazar campus - serving as the cradle of modern Indian science in first half of the twentieth century established being completely unaided by the colonial administration, and doing pioneering research in Nutrition and playing pivotal role in establishing Biochemistry departments in the country and again a person of commitment for social causes; Professor Sacchidananda Banerjee, hand woven khadi clad Professor of Physiology at Presidency College in 1940s and 1950s and later RD advisor in industries; Professor Subhas Mukherjee (1931-81), Professor of Physiology in medical colleges in West Bengal and his collaborator Professor Sunit Mukherjee.

The Conference, which may serve as a model for cost effective organization, came to an end with distribution of certificates to the participants at the valedictory session and thanks being offered to the participants, collaborators, university administration, and in particular to senior Dietician present from different hospitals and all concerned from organizing team. □

*Neepta Banerjee, Sandipan Chatterjee,
Surjani Chatterjee, Tanaya Santra,
Satbdi Bhattacharjee, Shankarashis Mukherjee**

**HPAFU, University of Calcutta and
Public Health Analytics Unit,
Department of Food and Nutrition,
West Bengal State University,
Kolkata 700 126
e-mail : msasish@yahoo.co.in*

New Electronic Skin Can Sense Touch Like Human Skin

Artificial skin with the ability to feel has been a major research goal for engineers working on improving prosthetic technology. Researchers in the past have created materials with sensors spread over a few square centimetres, but these had several limitations. Now, a team of

researchers at the National University of Singapore (NUS) led by Assistant Professor Benjamin Tee has developed the Asynchronous Coded Electronic Skin (ACES), an artificial nervous system that may endow robots and prosthetic devices with a sense of touch equivalent to, or better than, the human skin.

The unique sensor system of the new e-skin developed by Tee and his team responds 1,000 times faster than the human sense of touch, the fastest ever achieved for an e-skin. Apart from ultra-high responsiveness, the new electronic skin system is robust to damage and can be paired with any kind of sensor skin layers to function effectively as an electronic skin (Science Robotics, 18 July 2019 | DOI: 10.1126/scirobotics. aax2198). □

*Adapted from the article of Biman Basu
Dream 2047, October 2019, Vol. 22 No. 1*

JGVK at service of rural fish farmers - achievements during April-June 2019

Joygopalpur Gram Vikash Kendra (JGVK) located at Vill. Joygopalpur, Block and PS Basanti, Dist. South 24 Pgs, West Bengal is a NGO focusing on rural reconstruction, societal and economic transformation, environmental development and providing viable livelihood options to the poor population residing in fragile region of Indian Sundarbans. It has received recognition both from Government of India and Government of WB.

Fishery programme of JGVK is included under 'livelihood', one of the thematic areas of NGO's field-based activities. Almost every household in Indian Sundarbans region has a small-sized pond but are not used judiciously; scientific and improved fish farming (SIFF) is not often seen. In 2007, JGVK started a project on 'Experimenting scientific fish farming with polyculture of Indian major carps (IMC), minor carps and prawn' in collaboration with Royal Veterinary and Agricultural University, Denmark and Bangladesh Agricultural University. In 2009, Maa Sarada Matsya Hatchery was established at JGVK to produce good quality spawn and fry of IMC, *Labeo bata* and *Puntius javanicus* in sufficient quantity and supply to local fish farmers. Presently there are 12 fish ponds under JGVK, including 2 ponds taken on lease, covering 4 acres (1.6ha) of water area. After receiving training on different aspects of freshwater carp culture and carp hatchery operation here, about 600 farmers are involved in SIFF (till 2016-2017) professionally. In order to enhance economic status of small and marginal farmers by means of SIFF in ponds and to

improve protein food intake, intensive pisciculture activities were undertaken in surrounding eight villages of JGVK and hands-on training was imparted.

Fish ponds at JGVK range between 15-100dec in area. There are two carp broodstock ponds holding 350kg fishes, five nursery ponds (for production of fry-staged IMC), one grow-out culture pond for *Clarius batrachus* (desi Magur Machh), one pond for propagating and conserving small indigenous freshwater fishes and five composite fish culture ponds. In one of the composite culture ponds, since 2019, IMC are cultured in association with giant freshwater prawn and *Lates calcarifer* (Bhetki machh in Bengali). Fry of *L. calcarifer* 60mm size (200nos) was procured from local fry traders @ Rs 18/-/piece and juveniles of *M. rosenbergii* (60-72mm size) @ Rs 3.50-4.00/-/piece. About 10kg broodstock of *C. batrachus* is being maintained at JGVK and its seed production started in 2018. In June 2019, 4000nos of *Pangasianodon hypophthalmus* fingerlings (Pangas machh) (72-96mm size; Rs 4/-/piece) has been stocked in grow-out culture pond.

During April-July 2019, 450 *bati* (spawn measuring cup) spawn of the fishes Rohu, Catla, Mrigal, Bata and Japani punti has been produced at Maa Sarada Matsya Hatchery and 312 *bati* spawn has been supplied to 63 fish farmers. In nursery ponds (total 1.32 acre) of JGVK, rest amount of spawn were stocked and healthy carp fry (24-36mm size) were produced within 21 days; 780kg of which was supplied to 200 fish farmers and another 400kg is now being cultured in JGVK ponds. A portion of major carp fry has been stocked in *Lates calcarifer* pond, upon which juveniles of this carnivorous fish will prey and grow. A 1kg *L. calcarifer* will be sold @ Rs 480-500/-/kg, whereas 1kg carp fry @ Rs 90-100/-/kg. About 300kg of table-sized fish (250-2500gm) was produced at JGVK and sold during this period. Former DG of ICAR Hon'ble Dr S. Ayyappan; eminent fishery scientists Dr M. A. Wahab from Bangladesh, Late Dr M. C. Nandeesh, Dr S. D. Tripathi; Dr B. K. Chand and Dr R. K. Trivedi from WB University of Animal and Fishery Sciences have visited JGVK.

Since 2017, present News communicator sometimes participate as trainer and technology disseminator in on-campus and off-campus fishery trainings organized by JGVK for rural youths, entrepreneurs and marginal farmers, both men and women. Different technologies on fish hatchery management and seed production, nursery pond management, grow-out culture of carps, catfishes and newer concepts are discussed with trainees. During the National Workshop on 'Small Indigenous Freshwater Fish Species: Their Role in Poverty Alleviation and Food Security' organized by ICAR-CIFRI, Barrackpore during 23-25 Feb,

2010, eminent participants visited JGVK on field trip to gain knowledge about farmers' practice of small indigenous freshwater fish culture, especially *Amblypharyngodon mola* (Mourola machh). Secretary of JGVK Sri B. Mahakur made paper presentation in 8th Asian Fisheries Forum during 20-23 Nov, 2007 at Kochi, Kerala. Under his initiative, JGVK has developed successful package of practices for fish farmers on 'Major carp farming in association with giant freshwater prawn and *Amblypharyngodon mola*' and 'Integrated fish-cum-poultry farming'. Since 2001-2002, JGVK is working in selected rural areas of WB and Odisha and all staff are dedicated in improving quality of life of poor and deprived households with respect to food and social security. □

Subrato Ghosh

122/IV, Monohar Pukur Road, Kolkata – 700026

Email: subratoffa@gmail.com

International Workshop on Renewable Energy and Rural Empowerment

The International Workshop on 'Recent Developments in Renewable Energy and Rural Empowerment' was held at Visva-Bharati, Santiniketan on 8th September, 2019; it was organized by Department of Environmental Studies (DES), Visva-Bharati; Mission Innovation (DST-MI; Prime Minister's fund) of Govt. of India and NB Institute of Rural Technology, Kolkata. Discussion in the Workshop focused on generation of bioenergy from waste biomass resources, developments in enhancing biogas production and other issues. Dr (Mrs.) S. Chaudhury, Professor at DES and Convenor of Workshop stated that energy requirement of world is increasing everyday and consumption of fossil fuel is increasing, leading to global warming. To combat it and alternatively, renewable energy is a must; which should be brought to rural parts of India to give under-privileged rural people a better living condition.

In the Technical Session, Dr L. Fletcher from School of Civil Engineering, Leeds University spoke on 'Value at the end of sanitation value chain: an overview of Project in Bangladesh'. She discussed on identification of feasible options of transforming current approaches for faecal sludge (FS) management in selected Upazillas of rural Bangladesh, where 1440 households surveyed with pit latrines; reducing public health risks linked to handling biologically hazardous waste; determination of FS characteristics in pre-treatment; evaluation of pre-treatment of FS using sand beds and biodrying system; characteristics of bulking agents (BA; rice husk, saw dust, rice straw, organic market waste) and

dried FS; co-composting of sand bed dried FS and biodried FS in post-treatment; end product evaluation; enhancing nutrient value of compost by valorization; pelletization of FS compost; impact of co-composted FS on growth of spinach in pot trials. She opined that co-composting is a viable option for management of FS, composting process proceeded well regardless of the sludge and BA used, mixing of FS and BA is important to ensure material within windrows is homogenous.

Prof. A. Ross from School of Chemical and Process Engineering (Biotechnology and Biowaste Group), Leeds University spoke on 'Bioenergy from Aquatic Biomass'. He emphasized on valorization of wet biomass (algae, aquatic plants, food waste, manure) having high NPK, protein, ash, high value minerals and converting into energy; dry or wet processing and treatment process of aquatic biomass (hydrothermal treatment, anaerobic digestion or fermentation and biorefining involving extraction of lipids and other components); hydrothermal upgrading; nutrient value in macro- and micro-algae and macrophytes; processing of algae and seaweeds into different usable fuels; cultivation of microalgae for biofuels, its conversion into liquid fuels; processing of extracted oils and direct liquefaction of whole algae; bioethanol from algae; fertilizer and clean water development from invasive aquatic macrophytes; anaerobic digestion of water hyacinth for biogas production and its upgradation to biomethane; *in-situ* biomethanization.

Dr V. H. Dalvi from Institute of Chemical Technology (ICT), Mumbai spoke on 'Bioenergy for reviving rural Indian economy'. He discussed on primary energy use in India which is 32EJ / year, *i.e.*, 765 million tonnes of oil equivalent; crop residue used for fodder and rural cooking primarily on wood/dung *chullahs*; characteristics of improved cookstove; economic evaluation of different technologies like combustion, gasification or partial combustion, pyrolysis (no oxygen) and biomethanation. He stated that biomass can produce \$54 billion / year wealth in rural India and India has realizable potential of 11.88EJ of bioenergy per year. We must harvest biomass which is lucrative for farmers; major challenge is collection of biomass for processing. Dr S. S. P. Rajput from ICT spoke on 'Present situation of aquatic invasive macrophytes in India: Challenges and mitigative approach'. He discussed beneficial role of water hyacinth in bioremediation and wastewater treatment; control methods; 1kg of water hyacinth dry matter can yield 370lit of biogas. He emphasized on appropriate technology, waste to wealth and resource, employment generation and energy farming.

Finally Dr A. K. Hazra, Professor at Department of

Lifelong Learning and Extension, Visva-Bharati and Organizing Secretary of Workshop spoke on ‘Income Poverty and Energy Poverty: two sides of same coin!’ Like income poverty, energy poverty is defined by the minimum energy consumption needed to sustain lives and people under income poverty do not get \$2 a day. He discussed about absolute income poverty and absolute energy poverty in India; inequality in income and energy around the world; unequal growth in Indian people. We were informed that the richest 10% of Indians own 77.4% of country’s wealth; 27 crore people in India are in absolute poverty category; 49% and 27% of Indian population were in absolute poverty category in the years 2005-2006 and 2016-2017 respectively. In the end, Dr Hazra highlighted on the ongoing Project work on Poverty line analysis of Hengbung remote village of Manipur. □

Subrato Ghosh

122/IV, Monohar Pukur Road, Kolkata – 700026

Email: subratoffa@gmail.com

Oldest Evidence of Life on Earth Found in Australian Rocks

Human beings have been confronted for a long time with the question ‘where did we come from?’ Did life begin in ocean or on land? It is a hotly debated question, and no convincing information has been found out as yet. However, in a recent article published in the journal *Geology* in September this year (vol. 47, issue 11, pp. 1039-1043, 2019; <https://doi.org/10.1130/G46365.1>), Raphael J. Baumgartner *et al.* of the School of Biological, Earth and Environmental Sciences at the University of New South Wales (UNSW) in Australia have unearthed the presence of microbial remains, viz. organic matter (OM) in stromatolites (a kind of rock formations) in the nearly 3.5 billion-year-old Dresser Formation in Pilbara Craton, Western Australia.

Scientists believe that microbial life existed on earth around a billion years after it took shape. It was difficult to prove it since microbes are individually too small to be visible to naked eye. But conceivably, millions of microbes can fossilise together to form larger features that can be embedded in rock that are still preserved today. Such formations do indeed exist on Earth and are known as stromatolites. These are layered deposits of mainly limestone which are largely found in the Dresser Formation, located in the East Pilbara granite greenstone terrain in Western Australia. Scientists have been looking for evidence of primordial life on Earth in this area because it comprises

some of the oldest and best-preserved volcanic and sedimentary rocks on Earth. Cyanobacteria or blue-green algae (single cell microbes), the early life forms on Earth, were able to grow on the surface of sediments in shallow waters because high concentration of salt, resulting from evaporation, prevents snails and other predators to eat-up these algae. Stromatolites grow in the shape of columns, mounds or sheets.



Stromatolites in Shark Bay, Australia

Image Credit: Paul Harrison; commons.wikimedia

Since the discovery of Dresser Formation stromatolites in the 1980s, their origin has been a puzzling issue: were the stromatolites created by the then living cyanobacteria (single celled microbes) or are these purely of geologic origin? Their biological origin was difficult to be proven because time and weathering of these rock-like formations altered their mineralogy and inhibited the preservation of the biological remains.

In a search for biological remains or organic matter (OM) deep inside these stromatolites, Baumgartner and his co-workers collected samples from deep within these stromatolites by diamond drilling and analysed the samples (not affected by weathering) by cutting edge microanalytical techniques, viz. electron microscopy, spectroscopy, ion mapping and isotope analysis. High resolution textural, mineralogical and chemical analysis revealed that deep inside the stromatolites are dominated by ‘petrographically earliest’ nano-porous pyrite (a mineral also known as ‘fool’s gold’) that contains thermally mature, nitrogen-containing OM and which stromatolites are composed of. Put simply, they got the evidence of primordial life in the Aussie rocks, i.e. stromatolites that are *ca.* 3.5 billion years old. In the words of Baumgartner, it was a “*Eureka moment...This is an exciting discovery – for the first time, we’re able to show the world that these stromatolites are definitive evidence for the earliest life*

on Earth.” According to Martin Van Kranendonk, the Director of the Astrobiology Department of UNSW, the present discovery is a ‘smoking gun’ moment in science.

Pertinently, in 2017, a group of researchers identified 3.77-4.29 billion-years-old fossilized microbes in Canada. Kranendonk of UNSW is also investigating 3.7 billion-years-old stromatolites in Greenland. But in the opinion of Baumgartner, whether or not they were produced by living organisms “*is highly disputed in the literature.*”

The new finding is also important for another purpose. It is going to help NASA’s Mars Exploration programme ‘Mars 2020 Mission’ scheduled to be launched on July 17, 2020. Only months ago scientists from NASA and European Space Agency, including the Heads of the Mars 2020 Mission, underwent a week-long specialised training in how to trace the presence of ancient life in rocks. They hope that this training is going to help the Mars 2020 Mission scientists to trace ancient life on Mars.

We are left with a big question: ‘did life first originate on land in Earth’? Only future shall tell the truth. □

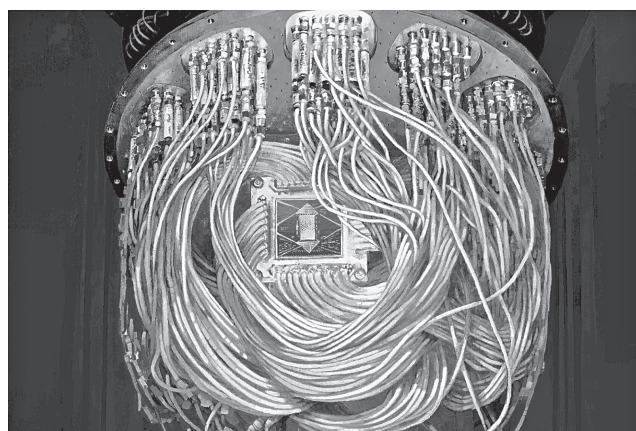
Manas Chakrabarty
Formerly, Professor of Chemistry
Bose Institute, Kolkata
e-mail: chakmanas09@gmail.com

Google Claims ‘Quantum Supremacy’

In a recent paper published in *Nature* (vol. 574, pp. 505-511) this year, researchers at Google of Alphabet Inc. claimed to have achieved ‘quantum supremacy’ by developing a programmable computer that has been able to outperform the most powerful supercomputers in a specific task. Using a 53-qubit quantum processor (which they named Sycamore), 277 digital-to-analogue converters to control the processor, 86 couplers (i.e. links between qubits) and a scheme to measure all the qubits simultaneously, they developed a quantum computer (QC) that generated around one million random strings of numbers in roughly three minutes. In contrast, even the world’s fastest conventional supercomputers would take 10,000 years to accomplish this task, they claim. The researchers expect that the QC would be able to deal with more difficult calculations if more qubits are added to it.

Unfortunately, Google’s claim has met with mixed reaction from competitors and industrial experts. For example, IBM Corporation, a rival in the commercialisation

of QCs, disagreed with Google’s claim and stated that the referred task could be taken care of by a conventional supercomputer in 2.5 days. An analyst at Gartner Inc., a technology research and advisory firm, admitted that the reported accomplishment is a proof of making progress towards quantum computing but it is a ‘non-event’ from the standpoint of the end-users. Some experts from competitors like Microsoft Corporation and IonQ Inc. insist that whether Google’s approach is the right one is yet to be checked.



Artist’s drawing of Sycamore
Credit: Forest Stearns, Google

In order to assess the impact of this new achievement, we need to understand ‘quantum supremacy’, for which knowledge of the difference between traditional computers and QCs is required. In traditional computers, the flow of electricity is utilised, and the switches inside the circuits can be turned ‘on’ or ‘off’ to generate ‘ones’ or ‘zeros’. These ones and zeros are called ‘bits’, each bit being the smallest piece of information stored in traditional computers. In contrast, QCs use ‘quantum bits’ or ‘qubits’ which can be set to zero, one or any combination of zero and one at the same time. A QC is thus enabled to process a huge collection of inputs simultaneously. For example, a 10-qubit QC could process up to 2^{10} or 1024 inputs at once instead of analysing them one at a time.

QCs rely on the physical properties of electrons, photons and other tiny bits of matter that are subject to the laws of quantum mechanics. Since these tiny bits of matter can act as both particles and waves, they lead to what are known as entanglement, superposition and interference. Superposition is a state, through which a particle can have two different amplitudes, i.e. can be at two different places at the same time. A change in one particle instantly changes another, which is known as entanglement. Interference states that an individual particle

can cross its own trajectory and interfere with the direction of its path. Our stable world arises out of the chaotic mess of superposition, entanglement and interference. A qubit can be in many states at once, meaning a qubit can contain considerably more information than a normal bit. When more and more qubits are added to the QC, its power grows exponentially. This is how quantum supremacy is created.

QCs have a great futuristic potential. QCs can be utilised to predict the function of a protein, help design a drug (to bind to a receptor in the right way), new chemical reactions, better batteries and the like. But QCs to be useful for such purposes would need to use say one million qubits, which is still a long way to go. Nevertheless, the achievement of Google's researchers can't be belittled. Their feat has been heralded as the beginning of a new computer era, comparable to Wright brothers' first flight of powered aircraft Kitty Hawk in 1903 and the launch of first earth satellite Sputnik 1 in 1957. John Preskill, a Caltech particle physicist who coined the term 'quantum supremacy', said that Google's QC has done something 'unprecedented'. Google's researchers modestly said that the calculation by Sycamore represents a benchmark to measure future quantum-computing experiments.

Let us look forward to a QC world. □

Manas Chakrabarty
Formerly, Professor of Chemistry
Bose Institute, Kolkata
e-mail: chakmanas09@gmail.com

Stormquakes: A New Seismic Phenomenon

Nearly three quarters of planet Earth is occupied by oceans. Scientists have known for a long time that the constantly sloshing ocean waves produce seismic signals at frequencies once every few minutes. Oceans also produce microseisms every five seconds or so. More importantly, oceans additionally generate signals of an intermediate nature at frequencies of 0.02-0.05 Hz occurring every 20-50 seconds. Until recently scientists used to disregard these seismic signals collectively as ambient noise or 'Earth's hum' (*Science News*, September 29, 2004). But in a report published online in *Geophys. Res. Lett.* (<https://doi.org/10.1029/2019GL084217>) on October 14, 2019, Professor Wenyuan Fan, a seismologist at Florida State University, Tallahassee, USA and his team have explained that these last named signals arise from a newly unveiled seismic phenomenon, which they dubbed 'stormquakes'. As the

name suggests, this geophysical phenomenon is a hybrid variety of storm and earthquakes where powerful storms such as hurricanes trigger seismic signals continuing for hours or even days.

These noisy wave-fields had so far been considered "typically incoherent". But when Fan *et al.* analysed only the low frequency seismic signals collected during the twelve-year period 2006-2019 by a network of moveable seismometers covering USA from west to east, focusing primarily on the data from the Pacific Northwest, they realised that there was indeed a coherence in the noise. When strong storms such as hurricanes and Nor'easters generate strong long period ocean waves, these waves can interact with shallow seafloor features located near the edge of continental shelves known as ocean banks. Such interactions produce seismic sources with equivalent earthquake magnitudes as high as greater than 3.5. Their analysis led to the detection of more than 14,000 stormquakes developed in waters offshore the east and west coasts of USA, eastern coast of Canada and the coast of Gulf of Mexico during the aforesaid period.

Stormquakes result from interactions between ocean, atmosphere and the solid Earth, in which seafloor topography also plays a role. As Fan explained, "*during a storm season, hurricanes or Nor'easters transfer energy into the ocean as strong ocean waves, and the waves interact with the solid earth producing intense seismic source activity.*" Put simply, when strong storms are created in the atmosphere, they produce really large waves on the surface of the sea. These waves then swell and form other types of waves further down that can reach deeper toward the seafloor. The interaction between these secondary waves and the sea floor produces a specific type of pressure force, which then creates a hammer-like effect on the seafloor. The outcome is stormquakes. Most wind-borne ocean waves generate signals at a frequency higher than the (20-50)-second cycle of a stormquake. But a broad shelf gives the waves time to interact with each other, perhaps stretching into a longer, lower frequency wave. Fan further noticed that stormquakes are seasonal, occurring in the winter seasons, whereas earthquakes do not have any seasonality. Of course, stormquakes have epicenters in oceans.

Other parts of the world including the west coasts of Europe and India have the right kind of sea floor topography and storm activity to produce stormquakes. But there is nothing to be worried about stormquakes since common people won't even be able to feel these quakes although they may be long-lasting. Nevertheless,

stormquakes provide the geologists / seismologists with a new means to investigate Earth's structure especially in offshore locations as well as ocean wave dynamics. A technique called 'seismic tomography' can generate high-resolution images of the seafloor, which, in turn, can determine how big the source of a stormquake is. A particular combination of a strong storm, ocean waves and seafloor shape is required to produce a perfect stormquake.

To conclude, the importance of this discovery has been best described by a seismologist: *"This paper is laying the foundation for building up new information about how the world works."* □

Manas Chakrabarty
Formerly, Professor of Chemistry
Bose Institute, Kolkata
e-mail: chakmanas09@gmail.com

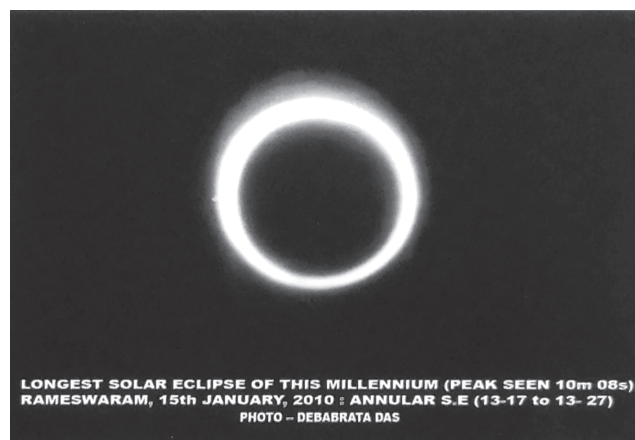
Celestial Golden Bangle

At the fag end of this year, on 26th of December, Annular solar eclipse of special significance to astronomers as well as to common people with a spectacular 'golden bangle' will be seen in some parts of India. This reminds me of my own experience of observing an annular eclipse 10 years back (January 15, 2010) in the island of Rameswaram in Tamilnadu. The eclipse was more than 10 minutes of duration, longest of the Millennium, mesmerizing innumerable viewers from all over India and abroad. Everyone was spell bound to witness a spectacular golden bangle floating in the cloudless clear sky for a long period of time (see figure). My mesmeric experience prompted me to provoke the readers of this journal to watch this rare celestial event scheduled to happen on 26th December 2019 in the sky of South India covering vast regions of Kerala and Tamilnadu and a small part of Karnataka. However, Utkamond (better known as Ooty) will be the best choice of location for this purpose because the duration of eclipse will be more than 3 minutes and the altitude of this town being 2240 metres, probability of getting clear sky is more than that in other places. If Ooty is not your choice, you can select one of the places, positions of which are near to the centre of "antumbra". Those are Coimbatore, Pudukkottai, Erode, Karur etc. in Tamil Nadu and Kasaragod, Thalassery, Palakkad, Kozhikode etc. in Kerala.

In total solar eclipse the moon completely covers the Sun. In annular solar eclipse the moon does not completely

cover the Sun, leaving the outer edges of the Sun visible which appears as a "ring of fire". We know that the orbit of our Earth around the Sun is elliptical and the orbit of the Moon around the Earth is also elliptical. But the angle between the planes of these two orbits is 5.1 degrees.

In December this year, the Earth stays almost at 'perihelion'- position and thereby being 5 million kilometres nearer to the Sun and the Moon will be exactly in between its "perigee" and "apogee" positions on December 26, 2019 and thus a large portion (93.2%) of solar disc will be covered. As a result, series of beads forming texture like a necklace might be visible on the edges of dark lunar disc at the beginning of the eclipse and just before the end of annular solar eclipse. This happens due to presence of craters on the rough lunar surface. These beads are called "Baily's beads" according to the name of the discoverer, Baily.



On the 26th December, 2019 in Ooty, 1st contact will occur at 8-05-48 IST. This is the beginning of partial solar eclipse. That means Earth has just entered at that time into the penumbra of the Moon and it will continue till 2nd contact at 9-26-58 I.S.T, when annular solar eclipse begins. The entire lunar disc enters then into the solar disc and at 9-28-35 I.S.T, covers the middle portion, producing extraordinary uniform golden bangle, that floats in the sky till the 3rd contact occurs at 9-30-11 I.S.T, when annular solar eclipse ends. Thus, the duration of annular solar eclipse in Ooty will be 3 minutes 13 seconds. After this at 11-09-37 I.S.T, 4th contact occurs, while the dark entire lunar disc comes out from the solar disc denoting the end of solar eclipse.

Besides India, this annular solar eclipse will be visible from many countries like Saudi Arabia, Qatar, Oman, Sumatra, Borneo, Philippines etc. The maximum duration of the said annular solar eclipse will be 3 minutes 40

seconds at a place in the South China Sea having the coordinates 0 degree 45 m 54 s North latitude and 105 degrees 29 m 06 s East longitude.

In Ooty, there is a fabulous lake, surrounded by eye-soothing greeneries. One can imagine the spectacular celestial exhibition under the backdrop of the lake.

Kolkata will experience partial solar eclipse – only 41.1 % of the solar disc will be shadowed. Kolkatans, who do not want to travel to Ooty, may depend on the live

telecast of this spectacular event in T.V by the courtesy of ISRO. Actually, geostationary satellites, successfully launched by ISRO from time to time are eagerly waiting in geosynchronous orbits for the particular date and time. □

Debabrata Das
Ex-Lecturer of Physics,
Dum Dum Motijhil College, Kolkata
e-mail : dasdebabratachandana@gmail.com

TO ALL READERS OF THIS JOURNAL

You might be knowing that UGC had delisted many of the journals from the UGC list of approved journals, including ours. We had been following up with UGC since then for reversing the decision based on the arguments that it is a peer-reviewed journal, is listed in the Thomson Reuters Master List of journals, has eminent members on its editorial board, and is available on-line on a website maintained by us.

UGC has replaced the old approved list of journals by the recent UGC-CARE (Consortium for Academic Research and Ethics) list with effect from 14th June, 2019. There are four categories of journals in this new list, from A to D. UGC recognized the academic integrity of our journal and has now included it in **Group A**. To explain what Group A means, I quote from the UGC website:

“Research journals from all disciplines indexed in Scopus (Source list) or Web of Science (Arts and Humanities Citation Index Source Publication, Science Citation Index Expanded Source Publication, Social Science Citation Index Source Publication). No further analysis of these journals will be done by the UGC cell and all such journals are included in the UGC-CARE list.”

The journal has been placed in the broad category of “**Multidisciplinary Sciences**” covering the areas of **Arts and Humanities, Science and Social Sciences**.

All articles published in this journal are now DOI (Digital Object Identifier) compliant. DOI increases the visibility of articles globally because interested readers can now easily locate a document digitally through a search engine.

Therefore all authors, especially young researchers, are requested to contribute their original research papers to *Science and Culture* as the published papers will be duly recognized by the competent authority for any assessment procedure.

S.C. Roy

Editor-in-Chief, Science and Culture