

**INDIAN NATIONAL SCIENCE ACADEMY**  
**BAHADUR SHAH ZAFAR MARG, NEW DELHI - 110002**

**Minutes of the 84<sup>th</sup> Anniversary General Meeting of the Indian National Science Academy held on 26-28 December, 2018 at Physical Research Laboratory, Ahmedabad.**

**The following Fellows were present:**

Professor Ajay K Sood, President, INSA  
Professor Kankan Bhattacharyya, Vice-President (Science Promotion)  
Professor Gadadhar Misra, Vice-President (Informatics and Publications)  
Dr Chandrima Shaha, Vice-President (International Affairs)  
Professor Anurag Sharma, Vice-President (Fellowship Affairs)  
Professor AK Singhvi, Vice-President (Science & Society)  
Professor Madhoolika Agrawal  
Professor KN Balaji  
Professor Sanghmitra Bandyopadhyay  
Professor Narendra Bhandari  
Dr Anil Bhardwaj  
Professor NM Bujurke  
Professor B Buti  
Dr SL Chaplot  
Professor AK Chakraborti  
Professor Amita Das  
Professor Maitrayee Dasgupta  
Professor S Dattagupta  
Professor Deepak Gaur  
Professor Samudrala Gaurinath  
Professor Aswini Ghosh  
Professor Ashok K Giri  
Professor Srubabati Goswami  
Professor SA Haider  
Professor H Ila  
Professor Neeraj Jain  
Dr Dinakar Kanjilal  
Professor Avinash Khare  
Professor SC Lakhotia  
Professor SK Mishra  
Professor Parthasarathi Mitra  
Professor G Parthasarathy  
Professor Sourav Pal  
Professor Vinod K Paul  
Professor NG Prasad  
Professor K Ramasubramanian  
Professor NV Chalapathi Rao  
Professor V Ravindran  
Professor Krishanu Ray  
Professor SD Rindhani  
Professor Probir Roy  
Professor SK Saidapur  
Dr PV Sane  
Dr Neelam S Sangwan  
Dr Rajendra S Sangwan  
Professor Parameswaran Sankaran  
Dr Manmohan Sarin  
Professor Abhijit Sen

Professor BA Shanbhag  
Dr Yogendra Sharma  
Professor Shyam Lal  
Dr Ashok Kumar Singh  
Professor Maya Shanker Singh  
Professor Rishi Narain Singh  
Professor Sunil Kumar Singh  
Professor Yashwant Singh  
Dr Alok Krishna Sinha  
Professor Subrata Sinha  
Professor PN Takkar  
Professor BK Thelma  
Professor Shubha Tole  
Dr Pradeep Kumar Tripathi  
Professor KC Upadhyaya

#### FOREIGN FELLOW

Professor Chennupati Jagadish

In addition, following fellows and foreign fellows had attended different sessions in the Anniversary General Meeting :

Professors IP Abrol, Ashima Anand, SK Apte, HS Balyan, DM Banerjee, AK Bhatnagar, Alok Bhattacharya, Praveen Chaddah, V Chandrasekhar, BM Choudary, Debajyoti Choudhury, Pijush K Das, SP Das, Debabrata Dash, Madhu Dikshit, Kunal Ghosh, Swapan Kumar Ghosh, K Gopalan, JN Goswami, Anil Kumar Gupta, KC Gupta, RK Gupta, NR Jagannathan, Bhavnath Jha, Chanda J Jog, Pankaj S Joshi, AK Kamra, Santosh Kapuria, R Khanna Chopra, Sulabha Kulkarni, Anil Kumar, GK Lahiri, Souvik Maiti, Nirupama Mallick, Mahitosh Mandal, Nibir Mandal, Indranil Manna, JP Mittal, NK Mondal, PP Mujumdar, Sunil Mukhi, K Muralidhar, MRN Murthy, VK Nandicoori, Ashwini Nangia, Y Narahari, GP Pandey, IBS Passi, SK Pati, Deepak Pental, AV Rama Rao, Mamiyil Sabu, Anunay Samanta, Kalidas Sen, Shobhona Sharma, TR Sharma, BN Suresh, AK Tripathi, RK Varshney, K Veluthambi, JS Yadav (Fellows) and Professors Subir Sachdev and Gilles Jean Georges Pisier (Foreign Fellows).

During the Anniversary Meeting (26-28 December 2018) the following seven symposia, one award lecture, one public lecture and the anniversary address by President, INSA were organized:

#### **26 December 2018 at Physical Research Laboratory, Ahmedabad**

Opening remarks was given by Professor AK Sood, President, INSA; Dr Anil Bhardwaj, FNA, Director, PRL, Ahmedabad welcomed and introduced the members at PRL. He presented a brief overview on history and research activities of the institute. He also apprised the members about the ongoing programmes / projects of PRL. Dr Bhardwaj thanked President, INSA for providing the opportunity to host INSA AGM at PRL. Inaugural address was delivered by Dr AS Kiran Kumar, former Chairman, ISRO, Dept. of Space, Bengaluru. Vote of thanks was given by Professor AK Singhvi, FNA.

Presidential Address on *Nano Heat Engines* was delivered by Professor AK Sood, President, INSA (summary of the lecture at **Annexure-I, p/ 9**).

**Session - I** Chair: Professor AK Sood, FNA

#### **Symposium 1**

**Vikram Sarabhai Space Science Symposium (Vs4): Innovations from Space Program**  
(Conveners: Dr BN Suresh, FNA and Dr Anil Bhardwaj, FNA)

The following lectures were delivered during the above symposium:

*ISRO Programs, Present and Future Directions and Their Contribution in Nation Building, Launch Vehicles, Innovation and Future Premises* by Dr BN Suresh, FNA; *Satellites, Interplanetary Missions, Technologies and Future Trends* by Sri P Kunhikrishnan, Director, URSC, Bengaluru; *Space Application Programme: Societal Applications and Their Benefits* by Dr P Diwakar, Earth Science Program, ISRO HQ, Bengaluru.

**Session-II Chair:** Professor AK Sood, FNA

INSA Award Lecture:

Aryabhata Medal (2018) Lecture on ***Need for Integration of Ayurveda with Modern Biology and Medicine*** was delivered by Professor SC Lakhota, FNA. (summary of the lecture at ***Annexure-II, p/ 10***)

**Session-III Chair:** Professor K Veluthambi, FNA

## **Symposium 2**

### ***Food Security and Genomics***

(Conveners: Professor Deepak Pental, FNA, Dr RK Varshney, FNA and Dr IP Abrol, FNA)

The following lectures were delivered during the above symposium:

*Transgenic Technologies for Low-input, High-output Agriculture* by Professor Deepak Pental, FNA; *Translational Genomics for Agriculture* by Dr RK Varshney, FNA; *Plant Pathogen Interaction-Developing Disease Resistant Plants* by Dr TR Sharma, FNA; *Conservation Agriculture* by Sri ML Jat, International Maize and Wheat Improvement Center, Delhi and *Future Agriculture* by Dr IP Abrol, FNA.

**Session-IV Chair:** Dr Anil Bhardwaj, FNA

A Public Lecture on *Reflections from a Personal Journey as Scientist, Technologist and Entrepreneur: Academia and Industry Interactions* was delivered by Dr AV Rama Rao, FNA. (summary of the lecture at ***Annexure-III, p/ 11***)

**27 December 2018 at Institute of Plasma Research, Bhat (forenoon)**

**Session-V Chair:** Professor Shobhona Sharma, FNA

Dr Shashank Chaturvedi, Director, IPR, Ahmedabad welcomed and introduced to Institute of Plasma Research. He presented a brief accounts of IPR activities. Institute of Plasma Research is an R&D organization under Department of Atomic Energy, Govt. of India. The Institute largely involved in the theoretical and experimental studies in Plasma Science including basic plasma physics, magnetically confined hot plasmas and plasma technologies for individual application. Dr Chaturvedi also apprised the members about the research & development activities carried out by the institute. President, INSA expressed his sincere thanks to Dr Chaturvedi for co-hosting INSA AGM at IPR and presented him a shawl and a set of INSA Publications.

**Session-VI Chair:** Dr Shashank Chaturvedi

## **Symposium 3**

### ***Scaling Up Artificial Intelligence in India***

(Convener: Professor Y Narahari, FNA)

The following lectures were delivered during the above symposium:

*The AI Tsunami* by Professor Y Narahari, FNA; *Artificial Intelligence Methods for Biological Data Analysis* by Professor S Bandyopadhyay, FNA; *The Unreasonable Effectiveness of Machine Learning in the Sciences of the Artificial* by Professor Vijay Chandru, Stand Life Sciences, Bengaluru and *AI in Hydrology and Water Resources* by Professor PP Mujumdar, FNA.

A Panel Discussion on *Strengthening AI Research & Education in India* was held by the following Panellists:

Professor Sanghmitra Bandyopadhyay, FNA, Professor Chiranjib Bhattacharyya, IISc, Bengaluru and Professor Vijay Chandru, Strand Life Sciences, Bengaluru.

**27 December 2018 at IIT Gandhinagar (afternoon)**

**Session-VII Chair:** Dr Chandrima Shaha, FNA

Professor Sudhir K Jain, Director, IIT, Gandhinagar welcomed and introduced to IIT Gandhinagar. In a brief presentation, he informed, IIT Gandhinagar was established in 2008 and it strives to offer the best under graduate and graduate education in India. The institute promotes not only the academic excellence but also the holistic development of the students. Members were apprised about the programmes offered by the institute. Professor Jain emphasised, apart from the graduate programme in Engineering and Science, the institute also offers PhD in literature, philosophy, psychology, political science and social epidemiology. Members were also intimated about the infrastructure and other facilities provided by the institute. President, INSA thanked Professor Jain for co-hosting INSA AGM meeting in this prestigious institute and gifted him a shawl and a set of INSA Publications.

#### **Symposium 4**

**Water Futures Chair:** Professor RN Singh, FNA  
(Conveners: Professor PP Mujumdar, FNA and Dr VM Tiwari, NGRI, Hyderabad)

The following lectures were delivered during the above symposium:

Introductory Remarks by Professor PP Mujumdar, FNA; *Human Alterations of Catchment Processes: Understanding the Cauvery Conflict* by Professor Veena Srinivasan, ATREE, Bengaluru; *Adaptation of Irrigated Agriculture under Global Change* by Professor M Sekhar, IISc, Bengaluru; *Hydrologic Simulations of Human-Natural System: Simple vs Complex Models* by Professor Subimal Ghosh, IIT, Mumbai and Concluding Remarks by Dr VM Tiwari, NGRI, Hyderabad.

**Session-VIII Chair:** Professor JP Mittal, FNA

#### **Symposium 5**

**Ethics in Science Research and Education**  
(Convener: Professor K Muralidhar, FNA)

The following lectures were delivered during the above symposium:

Introductory Remarks by Professor K Muralidhar, FNA; *Ethics: Issues and Dimensions* by Professor K Muralidhar, FNA; *Ethics in Publications* by Dr Praveen Chaddah, FNA; *Ethics in Work Places* by Dr Sunil Mukhi, FNA; *Gender Issues/Equal Opportunity* by Professor Shobhona Sharma, FNA and *Ethics in Science Journalism* by Sri Pallav Bagla, NDTV.

28 December, 2018 at Physical Research Laboratory, Ahmedabad

Session-IX Chair: Professor Subrata Sinha, FNA

### Symposium 6

***New Drug Discovery and Development: The Indian Narrative***  
(Conveners: Dr Madhu Dikshit, FNA and Professor BK Thelma, FNA)

The following lectures were delivered during the above symposium:

Introductory Remarks by Dr Madhu Dikshit, FNA; *Drug Discovery and Development in India: An Industry Perspective* by Dr Deepa Joshi, Torrent Pharma, Ahmedabad; *Discovery of a Potent Activator of AMPK: A Collective Effort of Industry and Academia* by Professor Parimal Misra, Dr Reddy's Institute of Life Sciences, Hyderabad; *Translating Technologies in India: A Scientist's Perspective* by Dr Praveen Kumar Vemula, InSTEM, Bengaluru and *Summing Up and Overview* by Professor BK Thelma, FNA.

Session-X Chair: Professor Sourav Pal, FNA

### Symposium 7

***Sustainable Energy and Chemical Engineering Platforms***  
(Convener: Dr Ashwini Nangia, FNA)

Overview presented by Dr Ashwini Nangia, FNA; *Continuous Manufacturing Platforms for Fine and Specialty Chemicals Industry: Relevance Toward Sustainability* by Dr Amol Kulkarni, NCL, Pune; *Sustainable Catalytic Transformations of Renewables into Chemicals and Fuels* by Dr Paresh Dhepe, NCL, Pune; *Process Intensification through Multi-functional Reactors* by Professor Sanjay Mahajani, IIT, Mumbai and *Catalytic Hydrothermal Liquefaction – Sustainable Technology for Biomass Conversion to Drop-in Liquid Fuel* by Dr Ramesh Bhujade, RIL, Jamnagar

Session-XI Chair: Professor AK Sood, President, INSA

### Anniversary General Meeting

President, INSA welcomed all the Fellows at PRL, Ahmedabad. Thereafter, the regular agenda items were taken up.

#### 1. Condolence at the passing away of the distinguished Fellows and Foreign Fellow:

The sad demise of Professors Man Mohan Chawla, Hira Lal Nigam, Madathil Keralakurup Krishna Pillai, Erode Subramanian Raja Gopal (Fellows) and Ronald Charles David Breslow (Foreign Fellow) of the Academy was reported. The obituary notes were read by the President, INSA and all those present stood in silence for a minute as a mark of respect to the departed souls.

#### 2. Confirmation of minutes of the Annual General Meeting held on 12 October, 2018.

Professor Anurag Sharma, Vice-President (Fellowship Affairs) gave a brief overview of the issues discussed in the Annual General Meeting of the Academy held on 12 October 2018 at CBMR, SGPGIMS, Lucknow. The minutes were thereafter confirmed by the members of the general body.

**3. Announcement of the award of the General Medal / Lecture due for the year 2019.**

Professor Anurag Sharma, Vice-President (Fellowship Affairs) announced the names of the recipients of General Medal / Lecture due for the year 2019 as follows:

**General Medal:**

Chandrasekhara Venkata Raman Medal to Professor K VijayRaghavan, FNA  
Shanti Swarup Bhatnagar Medal to Dr Chandrima Shaha, FNA

**General Lecture:**

KS Krishnan Memorial Lecture to Professor Rohini Godbole, FNA

**4. Announcement of name of recipient for Jawaharlal Nehru Birth Centenary Medal for the year 2019.**

Professor Anurag Sharma, Vice-President announced that Professor PM Ajayan (Rice University, USA) has been awarded the Jawaharlal Nehru Birth Centenary Medal (2019).

He informed that the council has decided the allocated expenditure for the recipient of Jawaharlal Nehru Birth Centenary Medal will be at par with the expenditure approved for the recipients of INSA overseas chairs.

**5. Announcement of name of recipient for Jawaharlal Nehru Birth Centenary Visiting Fellowship for the year 2019.**

The name for the recipient of the Jawaharlal Nehru Birth Centenary Visiting Fellowship (2019) will be decided later.

**6. To announce the voting results on amendment of INSA Rules:**

- 1. Transfer of Rule 40 (f) to Rule 35**
- 2. Revision in Rule 25 (iv)**

Professor Anurag Sharma, Vice-President informed to Fellowship that Academy had circulated an electronic ballot paper for voting to transfer of Rule 40 (f) to Rule 35 and revision in Rule 25 (iv). 99% of Fellows voted in favour of the transfer of Rule 40 (f) to Rule 35 and 96% of Fellows voted in favour of the revision in Rule 25 (iv). The Rules, thus, stands amended.

**7. To read as required under Rule 40(c) the name of nominees for election as INSA Fellow from 17 September, 2018 to 10 December, 2018.**

Professor Anurag Sharma, Vice-President, INSA read out the names of those whose nominations have been received for election as Indian Fellows.

**8. To report appointment/ retirement of staff of the Academy since last Anniversary Meeting.**

Professor Anurag Sharma, Vice-President announced the names of those staff members who retired during the year 2018. It was noted that no permanent staff was appointed in 2018.

9. Anniversary Address on **Nano Heat Engines** by Professor Ajay K Sood, President, INSA.

Professor Ajay K Sood, President, INSA delivered the Anniversary Address on 26 December, 2018 in the first Session.

10. **Admission of Fellows under Rule 11**

Professor Ajay K Sood, President INSA inducted 32 Fellows including two Foreign Fellows (list enclosed at **Annexure-IV, p/ 12-17**). The inducted fellows took the oath, signed the fellowship register and received the fellowship scroll from President INSA. They were also presented with Fellowship tie and the lapel pin/ scarf.

11. **Presentation of awards:**
- a) INSA Teachers Award
  - b) INSA Medal for Young Scientists
  - c) INSA Medal for Young Historian of Science

11 INSA Teachers Awardees received the INSA Teachers award from President INSA. In addition, of the 30 Young Scientists selected in 2018, 20 received the INSA Medal from President INSA and 1 Young Historian awardee received the INSA Medal from President INSA. The list is given at **Annexure-V, p/ 18-22**.

12. **Presentation of mementos to outgoing Officers and members of the Council of INSA.**

The outgoing members of the Council (Professor Kankan Bhattacharyya, Professor Chandrima Shaha, Vice-Presidents; Professor BK Thelma, Professor K Veluthambi, Members) were felicitated. President, INSA presented them a shawl as a token of respect. (Other members: Professor Manindra Agrawal, Professor US Bhalla, Professor Subhasis Chaudhuri, Professor SP Trivedi, Professor PP Chakrabarti (as representative of DST Nominee), Professor Paramjit Khurana (as representative of NASI) were not present during this function). President profusely thanked the members of the Council for their continued support to him in carrying out the programmes during his tenure as a President of the Academy.

A brief presentation of INYAS activities was made by Dr Mahesh Kumar, Chair, INYAS, IIT Jodhpur.

After taking the formal agenda items, President, INSA discussed the following issues which were discussed / decided by the Council in the previous night. He informed the members that INSA has obtained the income tax exemption under 80G which will lead to 50% tax exemption to the donors. Those who will contribute to Academy's corpus fund, will get this exemption.

He further informed, as decided in the July council meeting, a committee was constituted under the chairmanship of Professor SK Joshi to reallocate the present sectional committees. The committee met twice in 31<sup>st</sup> August and 19<sup>th</sup> November in INSA and finalized the revised structure of sectional committees. Thus, the number of sectional committee has been reduced from twelve to ten.

The members were intimated that on invitation of DST and accepted by the council, an Innovation Cell will be established at INSA. This cell will be coordinated by Fellows of four academies (NASI, IASc, INAE and INSA). The first meeting of the cell will be held on 5<sup>th</sup> March, 2019 at INSA.

President apprised the members about the new website of INSA which is being prepared at IIT Kanpur with the help of Professor Manindra Agrawal. Professor AK Singhvi and Professor Gadadhar Misra are coordinating this initiative. This new website will be activated by February 2019.

President informed that INSA also has Facebook account in which the latest photos and news of the Academy's activities are uploaded. Fellows were requested to inform INSA, if they receive any award/ fellowship or major achievement, so that it can be uploaded on INSA Facebook.

Further he intimated the members that number of INSPIRE Fellowships have been reduced from 200 to 100 per year. Now there will be ten subject committees as per the revised INSA Sectional committees.

President briefed the members about the book released / to be released by the Academy. Four books namely, 1. Water Futures by PP Mujumdar and VM Tiwari, 2. Ethics in Science Research and Education by Amit Ghosh, K. Muralidhar, 3. Emergence of Modern Science in Colonial India by A.K. Bagh, Arnab Choudhuri and Deepak Kumar and 4. Meghnad Saha: Man and his Science through selected letters and writings by Jibamitra Ganguly (under review) will be released on 28 February, 2019.

The other books to be released during 2019 are : New Drug Discovery and Development: The Indian Narrative by Madhu Dikshit and BK Thelma; Food Security And Genomics by Deepak Pental, RK Varshney and IP Abrol; Technological, economic and social impact of Earth Sciences by V Gahalaut and M Rajeevan and Biomedical Implants and Materials Mission by Bikramjit Basu.

Members were informed that Professor SC Lakhotia will step down as Editor-in-Chief of INSA after completing five years. Professor Sanjay Puri will take up this assignment w.e.f. 1<sup>st</sup> January, 2019.

President, INSA expressed his sincere thanks and appreciation to Dr Anil Bhardwaj and his team, the host, for the excellent arrangement for organizing this meeting. He also extended his thanks to both the co-hosts Professor Shashank Chaturvedi, Director, IPR and Dr SK Jain, Director, IIT Gandhinagar for their generous support. Dr Anil Bhardwaj was gifted a set of recent INSA Publication and a shawl. Lastly, President thanked Professor AK Singhvi for his enormous effort to make this mega event successful. He presented a shawl to Professor Singhvi and also gifted him a set of INSA publications for Gujarat Science Academy.

The meeting ended with a vote of thanks to the Chair.

**A.K. SOOD***President, INSA &**Department of Physics, Indian Institute of Science, Bengaluru***Nano Heat Engines: Extracting Work from Bacterial Baths**

Artificial microscale heat engines are prototypical models to explore the mechanisms of energy transduction in a fluctuation dominated regime. This talk will first discuss our experiments to realize a micrometer sized active Sterling heat engine operating between two nonequilibrium reservoirs with different activities of the bacteria. At high activities of bacteria, the efficiency of our heat engines surpasses the equilibrium saturation limit of Sterling efficiency.(1)

A key requirement to achieve performance of macroscopic non-Equilibrium engines, all lifeforms, is to build collections of heat engines that perform in unison. Here, in our recent work, we demonstrate that the act of building a pair of heat engines with optical traps in close proximity, increases their performance even in the absence of bacterial reservoirs. We show that the synergistic action between two microspheres, optically trapped in close vicinity, amplifies the non-conservative probability flows, Brownian vortexes, that transduce optical energy to thermal energy. Our work highlights a future pathway for the construction of macroscopic non-equilibrium engines.(2)

- (1) S. Krishnamurthy, S. Ghosh, D. Chatterji, R. Ganapathy and A.K. Sood, *Nature Physics* 12, 1134 (2016)
- (2) S. Krishnamurthy, R. Ganapathy and A.K. Sood (2018)

**Speaker Profile**

*Prof. A.K. Sood, FRS is an Honorary Professor in Department of Physics at Indian Institute of Science, Bengaluru. He is currently the President of the Indian National Science Academy and the Secretary General of The World Academy of Sciences (TWAS). He was the President of the Indian Academy of Sciences from 2010 to 2012. Currently, he is a member of the Science, Technology and Innovation Advisory Council of the Prime Minister of India. Prof. Sood's research interests include Physics of Nano systems such as graphene and other 2D materials and soft condensed matter, with a strong focus on innovative experiments. The latter includes the flow behaviour such as rheochaos, nonequilibrium phase transitions, deconstruction of glass physics using colloid experiments, active matter and stochastic thermodynamics. The experimental probes used for exploring physics at nanoscale are Raman spectroscopy, Ultrafast time resolved spectroscopies including terahertz spectroscopy, transport measurements and x-ray diffractions. He has published close to 400 papers in refereed international journals and holds a few national and International patents. His work has been recognized by way of many honors and awards. These include the Fellowship of the Royal Society (FRS), all the three science academies of India and TWAS; the civilian honor, Padma Shri by Government of India, S.S. Bhatnagar Prize, G.D. Birla Award, TWAS Prize in Physics, FICCI Prize, Goyal Prize, M.N. Saha Award and Millennium Gold Medal of Indian Science Congress, Sir C.V. Raman Award of UGC, Homi Bhabha Medal of Indian National Science Academy, DAE Raja Ramanna Award of JNCASR, National Award in Nanoscience and Nanotechnology by Government of India, Nano Award by Government of Karnataka, G.M. Modi Award of Science and R.D. Birla Award for Excellence in Physics by Indian Physics Association. He is Associate Editor of ACS Nano and Executive Editor of Solid State Communications.*



Aryabhata Medal Lecture (2018)  
Chair: A.K. Sood, Department of Physics, IISc, Bengaluru



### SUBHASH C. LAKHOTIA

*Cytogenetics Laboratory, Department of Zoology, Banaras Hindu University, Varanasi*

#### Need for Integration of Ayurveda with Modern Biology and Medicine

Concern for health since the beginning of civilization led each community to develop its own health/medical care system. Ayurveda, the oldest and well-documented Indian health-care system, is practiced for several thousand years. This experience-based system would have had its evidence-based origin. However, in the current perspective and practices, it is largely experience-based system with myths, fallacies and inappropriate commercial practices having made inroads in its integrative health-care practices and philosophies. Historically, the so-called 'modern medicine' practices and formulations had their origins in traditional health-care systems, especially Indian and Chinese. However, today the traditional and the modern medicine systems are competitive and mutually exclusive. Remarkable developments in all disciplines of natural sciences, including biology and understanding of human body and its systems, requires re-examination of Ayurvedic practices and formulations, not only for their claimed effectiveness but also for the physiological, cellular and molecular bases of their actions. Some of our results would be presented to illustrate advantages of Ayurvedic Biology. More such studies would generate the much needed evidence-based practices, and also provide simple quality-control systems for Ayurvedic formulations. This would finally lead to emergence of integrative health-care incorporating the best practices of traditional and modern medical system.

#### Speaker Profile

Following his education at Calcutta University and a short post-doctoral work at Delhi University, Prof. Lakhotia served Burdwan and Gujarat Universities before moving to Banaras Hindu University in 1976. Following superannuation, he continues as a Distinguished Professor and INSA Senior Scientist (2016-18) at BHU. His current research interests using *Drosophila* include i) roles of *hsr-omega* long non-coding RNAs in normal and stressed cells, ii) stress-induced genes and tumorigenesis, and iii) Ayurvedic Biology. Prof. Lakhotia actively discusses policies relating to higher education, research publications and assessment in India. He has published more than 160 research and ~80 other articles. He is member of Editorial Boards of *Journal of Biosciences*, *Annals of Neuroscience*, *RNA Biology*, *Cell Stress & Chaperones*, and editor-in-chief of the *Proceedings of the Indian National Science Academy*. He has received INSA YS Medal (1975), UGC National Lecturership, UGC Career Award, Bhatnagar Prize (Biological Sciences, 1989), UGC J.C. Bose Award (Life Sciences, 1998), INSA Sunder Lal Hora Medal (2002), Prof. C.N.R. Rao Education Foundation Award for Excellence in Research at BHU (2007), DST Ramanna Fellowship (2009), DAE Raja Ramanna Fellowship (2011). He is a fellow of the Indian National Science Academy, Indian Academy of Sciences, National Academy of Sciences India and a Senior Fellow of Cell Stress Society International.

**DR. A.V. RAMARAO***A.V.R.M. Industries, Hyderabad***Reflections from a Personal Journey as Scientist, Technologist and Entrepreneur (Academia and Industry Interactions)**

The speaker has the distinction of being one of the first Indian scientists to take a lead in nurturing and fostering integration in basic science, technology development and engineering design to provide complete package for commercial exploitations. He pioneered the concept of Institution and Industry interaction with several leading Indian pharmaceutical industries such as Cipla, Lupin, Cadila, Dr. Reddy's, FDC, etc. He is the first scientist to develop alternative affordable technologies for several essential generic drugs including anti-HIV drugs which enabled the Indian Pharmaceutical Industry to introduce them in the market at a fraction (1/5 to 1/10) of the prevailing international prices.

He is the first academic to realize the potential and commercial opportunity in providing chemical research services (CRAMS) to various National and International Pharmaceutical companies by starting such programs more than 3 decades ago. He showed that there was a viable business model in translating science to service and wealth. In fact he showed the potential of this business model by taking the plunge himself. He founded Avra Laboratories in 1995 after retiring as the Director of the Indian Institute of Chemical Technology (IICT). It is amongst the first companies in India to focus on high-end contract research, custom synthesis of complex chemicals and difficult to manufacture intermediates and APIs.

One example of the innovative technologies developed by Avra is the total synthesis of Irinotecan. This drug is a semi-synthetic derivative of the natural product Camptothecin and used to treat colorectal cancer. Using a 20 step synthesis, Avra has developed a commercially viable process to produce irinotecan and its intermediates with a higher purity at a lower cost. Avra is the first chemical / Pharmaceutical company to receive CSIR Diamond Jubilee Technology Award - 2014 (cash award Rs.10 lakhs) for the process.

**Speaker Profile**

*Rama Rao has trained 112 Ph.D. students. He published more than 260 papers in international scientific journals, developed over 30 process technologies for making life saving drugs more affordable and finally after retiring as Director of Indian Institute of Chemical Technology, built a multi-million dollar pharmaceutical company (Avra Laboratories) with 750 employees. At NCL, Rama Rao worked on the isolation and structural elucidation of plant and insect pigments, and on synthetic dyes. His subsequent work provided amazing achievements in the synthesis of biologically active natural products such as antitumor antibiotics, macrolide, immunosuppressants, cyclic peptides, etc. including Vancomycin representing complexity, diversity and aesthetics of modern asymmetric synthesis.*

*Rama Rao pioneered the concept of Institution and Industry interaction. He is the first scientist to develop affordable technologies for several essential generic drugs including anti-HIV drugs which enabled the Indian Pharmaceutical Industry to introduce them in the market at one-fifth to one-tenth of the prevailing international prices. Avra Laboratories are located in 4 sites based in Hyderabad and Visakhapatnam. It is amongst the first companies in India to focus on high-end contract research, custom synthesis of complex chemicals and difficult to manufacture intermediates and APIs. Rama Rao has received over 45 awards and honours including "Padma Shri" in 1991 and "Padma Bhushan".*

ADMISSION OF FELLOWS / FOREIGN FELLOWS

Fellows (w.e.f. 1<sup>st</sup> January, 2019)

1. **Madhoolika Agrawal** (b 01.05.1958), PhD, Head & Professor, Department of Botany, Banaras Hindu University, Varanasi.

For her significant research contributions on global environmental change including effect of O<sub>3</sub> and UV-B on agricultural crops under field conditions.

3. **Amita Das** (b 03.08.1965), PhD, Professor, Department of Physics, Indian Institute of Technology, Delhi. New Delhi.

For her foundational contributions in the field of laser plasma interactions emphasising the role of self-generated magnetic fields.

4. **Maitrayee Dasgupta** (b 27.12.1959), PhD, Professor, Department of Biochemistry, Calcutta University, Ballygunge Science College, Kolkata.

For her outstanding contribution in the field of root nodule symbiosis (RNS), particularly delineating the role of symbiosis and cytokinin signaling in developing RNS in crack-entry legumes like *Arachis*.

5. **Deepak Gaur** (b 18.09.1972), PhD, Associate Professor, School of Biotechnology, Jawaharlal Nehru University, New Delhi.

Dr Deepak Gaur for making significant contributions in understanding molecular mechanism of red cell invasion by malaria parasite, and his elucidation of novel candidates for malaria vaccine development.

6. **Samudrala Gourinath** (b 16.04.1972), PhD, Professor, Structural Biology Lab, School of Life Sciences, Jawaharlal Nehru University, New Delhi.

For establishing a strong structural Biology group to study structure-function relation in the infectious microorganisms *Entamoeba histolytica* and *Helicobacter pylori*. He has elucidated the function of Calcium-binding proteins involved in *E. histolytica* phagocytosis. His work has revealed novel features of cysteine biosynthetic enzymes in *E. histolytica* and DNA replication protein in *H. pylori*.

7. **Anil Kumar Gupta** (b 1952), PhD, Secretary, Gujarat Grassroots Innovations Augmentation Network (GIAN), Ahmedabad.

For opening new, creative, innovative and entrepreneurial bottom-up paths of progress for millions of creative, inclusive, generous minds of not only India but the world at large. He spawned the inclusive frugal grassroots innovation movement thirty years ago through the Honey Bee Network. It has created institutions some of which became part of national polity (such as SRISTI, GIAN and NIF) but these also redefined the concept of National Innovation systems.

8. **Neeraj Jain** (b 08.12.1960), PhD, Professor and Scientist VII, National Brain Research Centre, Manesar.
- Dr Neeraj Jain's work has increased our understanding of organization and information processing in sensorimotor areas of the mammalian brain. His work on adult brain plasticity and post injury reorganization has direct relevance to human disease.
9. **Dinakar Kanjilal** (b 20.02.1955), PhD, Director, Inter-University Accelerator Centre (IUAC), New Delhi.
- For his path-breaking development of high temperature superconducting electron cyclotron resonance ion source and for significant contributions to controlled modification of material-properties through high energy ion irradiation.
10. **Goutam Kumar Lahiri** (b 01.01.1960), PhD, Professor, Department of Chemistry, Indian Institute of Technology-Bombay, Mumbai.
- For his seminal contributions in the area of electron transfer in multi-metal complexes to understand biological processes and several organometallic catalytic reactions.
11. **Souvik Maiti** (b 30.09.1971), PhD, Senior Principal Scientist, CSIR- Institute of Genomics and Integrative Biology, New Delhi.
- For comprehensively studying thermodynamics basis of RNA quadruplexes to understand their role in gene expression. He has used integrated chemical biology approaches by modifying and designing small molecules that can modulate miRNA levels..
12. **Mahitosh Mandal** (b 01.01.1963), PhD, Professor, School of Medical Science and Technology, Indian Institute of Technology Kharagpur, Kharagpur.
- For his outstanding contributions to cancer biology, studying the role of both natural and synthetic inhibitors that impact survival and stress related signaling cascades and inhibit tumor growth. He has also innovatively applied the use of nanocomposites loaded with chemo therapeutics to overcome chemo-resistance.
13. **Vinay Kumar Nandicoori** (b 01.03.1969), PhD, Staff Scientist VII, Signal Transduction Lab1, National Institute of Immunology, New Delhi.
- For his seminal contributions towards understanding signalling and survival mechanisms of Mycobacterium tuberculosis, and developing technologies to study the pathogen towards translational objectives.
14. **Swapan Kumar Pati** (b 07.12.1968), PhD, Professor, Theoretical Sciences Unit, Jawaharlal Nehru Centre for Advanced Scientific Research, Bengaluru.
- For his significant contributions to the understanding of novel properties of molecules and materials systems using computational methods.

15. **NG Prasad** (b 16.08.1974), PhD, Associate Professor, Indian Institute of Science Education and Research Mohali.

For his outstanding contributions to our understanding of the role of immunity and sexual selection in evolution. This work has important implications for speciation.

16. **K Ramasubramanian** (b 1969), PhD, Professor, Department of Humanities and Social Sciences, Indian Institute of Technology Bombay, Mumbai.

Professor K Ramasubramanian is a prominent historian of classical Indic science with a strong grounding in the physical sciences as well as Sanskrit. He has done important research on the history of Indian astronomy, and his scholarly translations of the works of the Kerala School of Mathematics constitute a major contribution to an authentic assessment of the remarkable advances made in India foreseeing the development of calculus in Europe a few centuries later.

17. **Nittala Venkata Chalapathi Rao** (b 23.05.1969), PhD, Professor, Centre of Advanced Study in Geology, Banaras Hindu University, Varanasi.

For his cutting edge research on kimberlites, lamproites, lamprophyres, their entrained xenoliths and mafic dykes has significantly enhanced our understanding of the geodynamic evolution of the Indian lithosphere. He has established a world-class school of deep mantle petrology.

18. **Vajravelu Ravindran** (b 09.10.1965), PhD, Professor H, Institute of Mathematical Sciences, Chennai.

For his critical work on the computation of the Higgs boson cross-section and properties that contributed significantly to its discovery.

19. **Krishanu Ray** (b 16.12.1964), PhD, Professor-H, Department of Biological Sciences, Tata Institute of Fundamental Research, Mumbai.

For contributing significantly towards establishing a role for motor proteins in axonal transport, in particular specific cargo motor interactions. He has also provided key insights into the mechanisms that control sperm release in fruit fly. His work on F actin dynamics has key implications for the ability of animal cells to repel microbial invasion.

20. **Mamiyil Sabu** (b 31.05.1959), PhD, Professor, Department of Botany, University of Calicut, Kerala.

For contributing significantly on the taxonomy of families Zingiberaceae and Musaceae. Besides taxonomical aspects of palynology and cytology of these two families, he has published four monographs and established the largest germplasm collections of Zingiberaceae in India.

21. **Parameswaran Sankaran** (b 04.06.1959), PhD, Professor H, Institute of Mathematical Sciences, Chennai.

For his significant contributions to topology, group theory, representation

theory and algebraic groups. His work on equivariant Schubert calculus has been especially influential. The techniques and ideas of Sankaran proved to be crucial in the construction of Littelmann's bases. His results explicitly describing classical cohomology theories for toric manifolds have influenced works on higher algebraic K-theory and cobordism as well as equivariant compactifications.

22. **Yogendra Sharma** (b 02.01.1959), PhD, Chief Scientist and Group Leader, CSIR-Centre for Cellular and Molecular Biology, Hyderabad.

For discovering novel calcium binding protein superfamily of  $\beta\gamma$ -crystallins. Through his work he has established this family as the second most prevalent family of calcium binding proteins after EF-hand family.

23. **Ashok Kumar Singh** (b 01.07.1962), PhD, Head, Division of Genetics, Indian Agricultural Research Institute, New Delhi.

For his outstanding contributions in basic and applied research on rice genetics and molecular breeding and developing 14 basmati rice varieties and hybrids.

24. **Maya Shankar Singh** (b 06.02.1960), PhD, Professor of Organic Chemistry, Department of Chemistry, Institute of Science, Banaras Hindu University, Varanasi.

For his contribution to the development of selective one-pot reactions employing simple and easily available synthons leading to various important intermediates.

25. **Sunil Kumar Singh** (b 16.03.1971), PhD, Professor, Geosciences Division, Physical Research Laboratory, Navrangpura, Ahmedabad.

For his outstanding research on particle-water interaction and submarine groundwater discharge have provided new insights into regulating the flux and distribution of trace elements and isotopes to the ocean. His work on Re-Os chronometry of black shales enabled direct dating of sedimentary sequences in the country. He has made fundamental contributions on the Himalayan erosion and its linkage to climate and tectonics.

26. **Alok Krishna Sinha** (b 05.08.1969), PhD, Staff Scientist VI, National Institute of Plant Genome Research, New Delhi.

For his significant contribution towards understanding the MAPK cascade in plants. His research on regulation of SUB1A1 by MPK3 during submergence has led to understanding the underlying mechanism of submergence tolerance in rice. Blue light dependent regulation of MYC2 by MPK6 during Arabidopsis seedling development is another significant contribution.

### Fellows (w.e.f. 1<sup>st</sup> January, 2018)

1. **KN Balaji** (b 1966), PhD, Professor, Department of Microbiology and Cell Biology, Indian Institute of Science, Bengaluru.

For his outstanding contributions towards elucidating immune evasion strategies employed by pathogenic mycobacteria and for identifying the novel roles for host signaling pathways, microRNAs and epigenetic modifiers.

2. **Paul, Vinod Kumar** (b 1955), MBBS, MD, PhD, National Member, National Institution for Transforming India, NITI Aayog, Government of India, New Delhi.

Dr Vinod K Paul has extensively contributed to research in new born and child health, established the Indian neonatal-perinatal data base, developed a low cost indigenous lung surfactant for premature new borns, formulated and promoted low birth weight feeding strategies for global recommendation and alerted the world to anti-microbial resistance to *Acinetobacter* sp. and *Klebsiella* strains as a cause of neonatal sepsis. His scientific contributions have improved neonatal healthcare by influencing public health policies globally.

3. **Shubha Tole** (b 1967), PhD, Professor, Department of Biological Sciences, Tata Institute of Fundamental Research, Mumbai.

For her fundamental contributions to the genetic mechanisms that regulate the development of mammalian brain.

### Fellow (w.e.f. 1<sup>st</sup> January, 2016)

1. **Sanghamitra Bandyopadhyay** (b 17.04.1968), PhD, Professor, Machine Intelligence Unit, Indian Statistical Institute, Kolkata.

For her contributions to genetic algorithm based clustering with applications to image processing and computational biology.

### Foreign Fellow (w.e.f. 1<sup>st</sup> January, 2019)

1. **Subir Sachdev** (b. 1961), Department Chair and the Herchel Smith Professor of Physics, Department of Physics, Harvard University, Cambridge, MA 02138, USA.

Professor Subir Sachdev is a world renowned condensed matter theorist, with many seminal contributions to the theory of strongly interacting condensed matter systems. He is a pioneer in the study of systems near quantum phase transitions. He has also pioneered the exploration of the connection between physical properties of modern quantum materials and the nature of quantum entanglement in their many-particle state, elucidating the diverse varieties of entangled states of quantum matter.

**Foreign Fellow (w.e.f. 1<sup>st</sup> January, 2018)**

1. **Chennupati Jagadish** (b. 1957), Distinguished Professor and Head of Semiconductor Optoelectronics and Nanotechnology Group, Department of Electronic Materials Engineering, Research School of Physics and Engineering, The Australian National University, Canberra, ACT 2602, Australia.

For his pioneering contributions to semiconductor optoelectronics and nanotechnology, in particular, to the development of quantum well, quantum dot and nanowire lasers, photodetectors and solar cells.

**INSA TEACHERS AWARD - 2018**

1. **Dr Javed Ali** (b 17.07.1972), Department of Pharmaceutics, School of Pharmaceutical Education and Research, Jamia Hamdard, New Delhi

Dr Ali is a compassionate and enthusiastic academician who has mentored a large number of well qualified and competitive students in the field of Pharmaceutics.

2. **Dr Urmi Bajpai** (b 30.09.1969), Acharya Narendra Dev College, University of Delhi, New Delhi

Dr Bajpai has contributed significantly to the growth of Biomedical Science as a teaching program at under-graduate level and has been a role model for a large number of students and faculty colleagues.

3. **Professor Nazir Ahmad Ganai** (b 12.05.1965), Faculty of Veterinary Sciences and Animal Husbandry, Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar

Professor Ganai, an inspirational teacher and a capable researcher, has trained many students in Veterinary Science and motivated them to take up research as a career.

4. **Professor Rajesh Ramachandran Iyer** (b 29.04.1966), Department of Physics and Electronics, St. Xavier's College, Ahmedabad

Professor Iyer is an outstanding teacher-mentor who has inspired generations of students to take up successful research career.

5. **Professor Prafulla Kumar Jha** (b 02.02.1966), Department of Physics, Faculty of Science, The M.S. University of Baroda, Vadodara

Professor Jha is an accomplished teacher renowned for his effective mentorship and guidance of students.

6. **Professor Vijaya Kumar Kopparapu** (b 14.01.1963), School of Earth Sciences, SRTM University, Nanded

Professor Kumar, an outstanding teacher in Geology, has motivated a large number of students to take up research in Petrology and Pre-Cambrian Geology.

7. **Professor Ashis Kumar Mukherjee** (b 10.07.1970), Department of Molecular Biology and Biotechnology, Tezpur University, Tezpur

Professor A K Mukherjee has significantly contributed to development of innovative teaching programs in Molecular Biology, Biotechnology,

Nanoscience and five year integrated M. Sc. programme in Bioscience and Bioinformatics which have benefited a large number of students in north-east India.

8. **Professor Achintya Mukhopadhyay** (b 04.04.1968), Department of Mechanical Engineering, Jadavpur University, Kolkata

Professor Mukhopadhyay has educated and inspired a large number of students to become successful engineers, researcher and academicians.

9. **Dr Sivaraman R** (b 10.04.1975), Department of Mathematics, DG Vaishnav College, Chennai

Dr Sivaraman motivated and supported a large number of students to take up career in Mathematics through his teaching, self-help books and articles in magazines and newspapers. His academic and financial help to needy and physically challenged students is especially noteworthy.

10. **Professor Vasudeva R** (b 20.06.1964), Department of Forest Biology and Tree Improvement, University of Agricultural Sciences, Dharwad, College of Forestry, Sirsi

Professor Vasudeva is an excellent teacher and an involved researcher, who has been an inspiration to students in the area of tree biology and forestry.

11. **Professor Srabani Taraphder** (b 31.07.1969), Department of Chemistry, Indian Institute of Technology Kharagpur, Kharagpur

Professor Taraphder's unique method to teach Statistical Mechanics through theory followed by advanced computer programming and her research, has inspired many students to reach successful academic careers.

## INSA MEDAL FOR YOUNG SCIENTISTS AWARDEES – 2018

1. **Dr Hafsa Ahmad** (b 26.05.1986), PhD, CSIR- National Botanical Research Institute, Lucknow

For developing novel formulations using Withanolides that have shown significantly improved potency in the experimental model of ischaemic stroke. Considering the limitations of the current medications for stroke, it has substantial translational value.

2. **Dr Mousomi Bhakta** (b 09.05.1983), PhD, Department of Mathematics, Indian Institute of Science Education and Research, Pune

For establishing results on Hardy equations with critical and super critical nonlinearities and obtaining significant regularity results on bounded and unbounded domains.

3. **Dr Mehak Gupta** (b 20.09.1988), PhD, Oilseeds Section, Department of Plant Breeding and Genetics, Punjab Agricultural University, Ludhiana

For her outstanding contribution in developing synthetic Brassicas and their evaluation.

4. **Dr Neha Gupta** (b 27.01.1986), PhD, Protein Conformation and Enzymology Laboratory, Department of Biosciences, Faculty of Natural Sciences, Jamia Millia Islamia, New Delhi

For demonstrating a novel mechanism of hypoxia-induced venous thrombosis that acts via NLRP3 inflammasome that has implications for high altitude medicine.

5. **Dr Biman Jana** (b 14.01.1983), PhD, Department of Physical Chemistry, Indian Association for the Cultivation of Science, Jadavpur

For theoretical understanding of molecular locomotion in motor proteins and mechanistic aspects of anti-freeze protein activity.

6. **Dr Somnath Jha** (b 11.07.1983), PhD, Department of Mathematics and Statistics, Indian Institute of Technology Kanpur, Kanpur

For establishing a basic twisting lemma in non-commutative Iwasawa theory and obtaining duality results for Selmer groups of ordinary Hida families of modular forms.

7. **Dr Charanpreet Kaur** (b 06.07.1985), PhD, Stress Physiology and Molecular Biology Laboratory, Jawaharlal Nehru University, New Delhi

For significantly contributing in understanding biochemical, molecular and functional properties of glyoxylase I and II enzymes, and demonstrating that methyl glyoxal acts as a stress-inducible signal molecule in plants.

8. **Dr Ujjwal Koley** (b 21.05.1983), PhD, Centre for Applicable Mathematics, Tata Institute of Fundamental Research, Bengaluru  

For obtaining higher order numerical schemes for KdV equations with an L2 initial data that gave a new theoretical framework for stochastic PDE's, and proved explicit continuous dependence estimates on entropy solutions in the presence of noise.
9. **Dr M Muthamilarasan** (b 02.12.1986), PhD, ICAR-National Research Centre on Plant Biotechnology, New Delhi  

For his outstanding contributions in developing genomic resources in foxtail millet.
10. **Dr Ratnesh Chandra Mishra** (b 11.05.1984), PhD, Laboratory of Functional Plant Biology, Ghent University, Belgium  

For experimentally validating rice Hsp101 gene using *Arabidopsis* Hsp101 null mutant and demonstrating that its expression provides complementation and thermotolerance.
11. **Dr Mukesh** (b 24.09.1984), PhD, Centre for DNA Taxonomy, Molecular Systematics Division, Zoological Survey of India, Kolkata  

For his important contributions in understanding of *Hangul* (Kashmir deer) population status, ecology and conservation issues and setting the appropriate critically endangered species status for *Hangul* and establishing in situ and ex situ management and conservation.
12. **Dr Aseem Sudhir Paranjape** (b 26.01.1983), PhD, Inter-University Centre for Astronomy and Astrophysics, Pune  

For his demonstration that the dark energy problem in cosmology cannot be eliminated by averaging over fluctuations and for his development of new techniques to study the growth of large-scale structures in the Universe.
13. **Dr R Vinu** (b 08.10.1984), PhD, Department of Chemical Engineering, Indian Institute of Technology Madras, Chennai  

For contributions to the development of low power microwave assisted pyrolysis of a wide range of municipal solid waste mixture of e-wastes, micro- and macro-algae, and coal biomass blends to produce valuable oils and blendstocks.
14. **Dr S Vijayan** (b 11.01.1983), PhD, Planetary Science Division, Physical Research Laboratory, Ahmedabad  

For finding of recent fluvial activities on Mars at location unknown before.
15. **Dr Sakya Singha Sen** (b 02.03.1983), PhD, Inorganic Chemistry and Catalysis Division, CSIR-National Chemical Laboratory, Pune

For stabilization of low valent main group compounds and their utilization as catalyst for cyanosilisation of carbonyl compounds.

16. **Dr Mayank Shrivastava** (b 14.09.1984), PhD, Department of Electronic Systems Engineering, Indian Institute of Science, Bengaluru

For contributions to the development, enablement, and integration of nano-scale CMOS and power MOSFET devices in System-on-Chip and power ASIC applications.

17. **Dr Sanjay Singh** (b 15.09.1983), PhD, School of Materials Science and Technology, Indian Institute of Technology, Varanasi

For the contributions to the fundamental understanding of magnetic shape memory materials.

18. **Dr Shallu Thakur** (b 03.02.1985), PhD, Division of Plant Biotechnology, Indian Institute of Pulse Research, Kanpur

For her outstanding contributions in allele mining for blast resistance in rice.

19. **Dr Vishvanath Tiwari** (b 15.09.1983), PhD, Department of Biochemistry, SLS Central University of Rajasthan, Ajmer

For using proteomic and bioinformatics approaches to develop insights and strategies to control antibiotic-resistant strains of *Acetobacter baumannii*.

20. **Dr Chandra MR Volla** (b 10.07.1983), PhD, Department of Chemistry, Indian Institute of Technology Bombay, Mumbai

For development of cost-effective catalyst using cobalt for C-H functionalization reactions.

#### INSA YOUNG HISTORIAN OF SCIENCE AWARD – 2018

1. **Dr Aparajith Ramnath**, Department of Humanities and Languages, School of Arts and Sciences and Amrut Mody School of Management, Ahmedabad University, Ahmedabad.

For his researches on the historical development of science and technology in twentieth-century India specially the engineering profession, addressing the nature of the late-colonial state and the history of industrialization.