

identification of fungal species. No new report of fungal species is entertained by international research journals based on morphological and microscopic traits, unless molecular characterization is done. Molecular characterization along with morphology authentically determines taxonomic identity. With the advent of molecular taxonomy and phylogeny, reclassification of fungal species began, thus challenging the older system of identification/classification. Given these facts, there exists a strong need for authenticating our NTCC accessions based on DNA sequence data.

During the tenth presentation on the 'Role of coccinellid beetles in biological control of forest insect pest', the success stories of coccinellids beetles in the biological control of a variety of insect pests were highlighted. Detailed discussion was held on the biological control of cottony cushion scale, *Icerya purchasi* Maskell (Margarodidae) by coccinellid beetle, *Rodolia cardinalis*; biological control of mealybugs by different species of coccinellids beetle, *Cryptolaemus montrouzieri*; biological control of Subabul Psyllid, *Heteropsylla cubana* Crawford (Psyllidae) by *Curinus coeruleus*, etc. Therefore, taxonomy of coccinellid beetles is important in terms of their distribution and seasonal variation, host specificity, uses and applications.

During the second technical session, the last presentation was on 'Insect pests

and diseases of trees of Haryana'. Wilt and dieback were identified as the most serious problems affecting *Dalbergia sissoo* in the state. Interestingly, clone no. FRI-DS-14, which is blend of high productivity, resistance to dieback, and an excellent bole form is under study. There is an urgent need to work on Eucalyptus gall wasp (*Leptocybe invasa*), little leaf, witches broom, *Cylindrocladium* leaf blight, gummosis, bark split and canker. In case of *Terminalia arjuna*, gall is a serious problem and no effective solution is currently available; therefore it needs special attention. Similarly, toon shoot borer (*Hypsipyla robusta*) causes serious losses. Further, >50% red cedar (*Cedrela toona*) trees are affected by phytoplasmas in Haryana and Uttarakhand. The nematodes of Indian forests affecting acacia, sal, teak, sandal, jamun, etc. were also discussed. In conclusion, it was suggested that we should focus on the conservation of indigenous natural enemies, generate awareness among all stakeholders, and organize workshops for forest managers to educate them about the disease and insect pest problems. Detailed discussions on various problems resulted in the following recommendations for strengthening research on forest diseases and insect pest problems:

1. Ecofriendly approaches for the management of forest insect pests and diseases should be promoted.

2. Regular surveillance and monitoring on seasonal appearance and population build-up of forest insect pests and diseases should be carried out for timely checking on outbreaks or epidemics.

3. Research work on key pathogens and insect pests of forests and their management should be carried out in programme mode.

4. Molecular characterization of fungi in the NTCC and important insects should be taken up.

5. Emphasis should be given to isolate and characterize novel pheromones for the management of key insect pests of Indian forests.

6. The role of climate change in pathological and entomological problems of forests should be examined.

7. Extension of the research findings on current developments regarding forest diseases and insect pest management should reach the stakeholders.

8. Species diversity of *Trichoderma* should be studied in the forest types of Uttarakhand Himalaya.

9. Molecular basis of host-pathogen interactions should be investigated.

Shailesh Pandey*, Sudhir Singh, Mohd. Yusuf and Amit Pandey, Forest Protection Division, Forest Research Institute, Dehradun 248 006, India.
*e-mail: pandeysh@icfre.org

MEETING REPORT

Indian Academy of Sciences, Bengaluru – 85th annual meeting*

The 85th annual meeting of the Indian Academy of Sciences (IASc) comprised of several talks, including inaugural lectures by fellows/associates, special lectures and symposiums.

The meeting commenced with a special lecture by Partha P. Majumder (President, IASc), who covered aspects of non-familial cancers, and the genes and genomic alterations that drive their

growth. He cited his work in identifying the drivers of oral cancer, the most common form of cancer among Indian males. He found that the genes associated with oral cancer in the Indian scenario are predominantly concerned with tumour-suppressors. Any alterations to these tumour-suppressor genes hinder their normal functioning of suppressing uncontrolled cell growth, one of the hallmarks of cancer. Identifying such drivers provides insights into tumour evolution, nature of alterations in genes and pathways in cancers and the complex alterations that result in the spread of

cancer. This understanding could also lead to improved handles on prediction, prevention and treatment of the disease, and enable learning of new processes in biological evolution.

The special lecture was followed by inaugural lectures by the elected fellows. Sandeep Kunnath (TIFR-CAM, Bengaluru) spoke about his research interests in studying inequalities that exist in mathematics, for example, Poincaré inequality, and Sobolev inequality, and provided a framework for understanding them. Tapas Maji (JNCASR, Bengaluru) gave a brief overview of his research on

*A report on the 85th Annual Meeting of the Indian Academy of Sciences held at the University of Hyderabad, Hyderabad during 8–10 November 2019.

low molecular-mass gelators and shared a few novel applications of such new materials.

Raghavan Sunoj (IIT Bombay) in his talk highlighted some of the present-day themes in the domain of asymmetric multi-catalytic reactions and drew rationalizations of experimental observations to provide guidelines for improvement in the design of asymmetric catalysis. Such recent developments in computational chemistry have enabled high-accuracy computations in understanding the mechanism of catalytic reactions. Santosh Kapuria (IIT Delhi) described the analysis of wave propagation in solids. Conventional finite element (FE) methods either require great computational effort and time, or yield inaccurate solutions. He proposed a wave packet enriched FE formulation for multi-field 1D and 2D wave propagation problems that generate better accuracy at much lesser computational cost, and can be readily extended to 3D wave-propagation problems.

Next there was a symposium on how plants and pathogens interact. Appa Rao Podile (University of Hyderabad) gave an overview of his team's research on using biological methods for controlling fungal diseases in plants. He also spoke about the mechanism behind these interactions between plants and pathogens, and how its understanding could be exploited for immunizing plants. Jagreet Kaur (University of Delhi) spoke about her research on disease resistance in oilseed mustard, in two particular cases: white rust and *Alternaria* blight. She discussed the disease resistance genes that her group mapped across different varieties of oilseed mustard, and how the introgression of these genes is being used to develop improved resistant varieties. On a similar line, Pushpendra Gupta (CCS University, Meerut) talked about his team's research on leaf rust and spot blotch disease in wheat. In particular, he gave an overview of his work on the transcriptomic and epigenetic analysis of several genes involved in the two diseases. Following disease resistance in wheat and oilseed, Swapna Datta (University of Calcutta) delivered a talk about other major crops in India such as rice and jute. He spoke about his research on genetically modified varieties with enhanced resistance to several plant pathogens and alluded to prospects of his work. Rajeev Varshney (ICRISAT, Hyderabad) spoke about his research on fungal pathogen

interaction in groundnut. He presented his work on the crosstalk between *Aspergillus flavus*, a fungus responsible for aflatoxin contamination in groundnut and discussed solutions that provide resistance against *A. flavus*.

The day ended with a public lecture by Sonal Mansingh, an eminent classical dancer and a Member of Parliament. She shared her knowledge about Indian dance forms and the rich cultural and historical background associated with them. The talk was followed by a cultural programme titled 'Sankalp Se Siddhi', which highlighted themes of contemporary importance depicted through classical stories.

The second day of the meeting started with a special lecture by K. VijayRaghavan (Principal Scientific Adviser to the Government of India). He began with a brief overview of how earth and life on this planet came into being, and how science has made possible the understanding of such phenomenon. He then spoke about the challenges that India faces in the field of science and technology (S&T) in the current epoch, the Anthropocene. He also underscored the problems that Indian science faces as a collective, for example, the fear of change, nativist ideologies, competence without comprehension, etc. Further, citing several articles from scientists and philosophers, he also talked about the future of S&T, and highlighted significant concerns of our times like environmental and climate change, data security, etc. and emphasized the role scientists in India and around the globe play in shaping the future.

Following the special lecture, V. V. S. S. Sarma (NIO, Visakhapatnam) in his talk pointed out that the present biogeochemical models are not projecting the real trends of factors that influence the biogeochemical processes in the Bay of Bengal. He cautioned that care must be taken while interpreting model outcomes and that new information on processes must be incorporated to predict how the ocean ecosystem is expected to modify due to climate change. Srinivasarao Yaragorla (University of Hyderabad) discussed the strategic approach of *in situ* allene synthesis and nucleophilic cyclization reactions to develop new chemical entities with synthetic, medicinal and material applications.

Next there was a symposium titled 'E. C. G. Sudarshan: Physics, Person and

Times' with Debajyoti Choudury (University of Delhi) reviewing the initial understanding of weak interactions, challenges in discovering the V-A theory and how the V-A theory of Marshak and Sudarshan played a crucial role in the establishment of the Standard Model. Subhash Chaturvedi (IISER, Bhopal) discussed Sudarshan's contributions to quantum dynamics. He presented the paper by Sudarshan, Mathews and Rau that envisaged a generalization of the integrated form of the Schrödinger equation. He also discussed the paper by Gorini, Kossakowski and Sudarshan that provided the final form of the evolution equation for open quantum systems. R. Simon (IMSc, Chennai) discussed the heralding of non-classical optics with the discovery of diagonal coherent state representation for arbitrary states of quantum optical fields by Sudarshan. He provided the context and importance of this paper with reference to those of Roy Glauber in the same year. Rohini Godbole (IISc, Bengaluru) presented the 'quantum Zeno paradox' or 'quantum Zeno effect', a phenomenon of the inhibition of (spontaneous or induced) transitions between quantum states by frequent measurements. In 1977, Misra and Sudarshan gave a theoretical demonstration of its existence. Shiraz Minwalla (TIFR, Mumbai) reviewed Sudarshan's discovery of the V-A interactions and brought out excerpts from an oral history interview conducted for TIFR archives. N. Mukunda (IASc) gave an account of the life and works of Sudarshan and shared some memories from his long association with Sudarshan. Mukunda also highlighted two critical contributions in the area of symmetry, not often remembered, and also spoke of their collaboration in the 1960s on Dirac theory of constrained Hamiltonian dynamics and unitary representations of the Lorentz group.

Following the symposium, Subeer Majumdar (NIAB, Hyderabad) talked about therapeutic proteins like insulin and interferons, and how they could be produced in the milk of larger animals to increase affordability. He spoke about his research on genetically engineering mice to produce human gamma interferon successfully and proposed a plan to scale up experiments in rabbits and buffaloes. Mohammad Ashraf (Jamia Millia Islamia, New Delhi) spoke about the physiological effect of high altitude on humans and its impact on human health.

Among other effects, he spoke in-depth about thromboembolism and his research about hypoxia-induced thrombosis. Nissim Kanekar (NCRA, Pune) delivered a talk on the fundamental constants and their evolution over cosmological time. He cited his work with the hydroxyl (OH) molecule to present his arguments and concluded that we have no statistically significant evidence to suggest a change in the fundamental constants. Utpal Nath (IISc) started with an unassuming question about how a leaf grows. Using this example, he explained the scaling laws that lie beneath the growth of leaves and other living beings, including humans.

The second public lecture of the meeting was delivered by the renowned Indian jurist, J. Chelameswar. He has served as a Judge of the Supreme Court of India and has delivered several landmark judgements. He spoke about what the Indian Constitution really means. He also highlighted the basic principles of the constitutional theory and provided a layman understanding of fundamental laws and justice systems in India. The talk was well-received following an engaging Q&A session.

The last day of the meeting began with a talk by Vaishnavi Ananthanarayanan (IISc) on the role of cytoskeleton and motor proteins. She gave an overview of her work on the dynamics between microtubules and mitochondria, and the cellular mechanism involved in it. Chandra Venkataraman (IIT Bombay) talked about atmospheric particles or aerosols in the context of air pollution and climate change. She spoke about her research on broadly asking questions about how pollution has an effect on climate change and the reverse feedback. K. Geetharani

(IISc) spoke about her research with cobalt-based complexes and how these can be applied to catalytic borylation reactions.

The morning talks were followed by another session by fellows and associates. Functional data analysis is increasingly becoming common in areas such as genetics, biophysics, imaging, energy, environmetrics, etc. Statistical analysis of functional data requires such data to be considered as elements of appropriate infinite-dimensional spaces. Since standard statistical methods are far from useful in analysing such data, there is a need to develop a new branch of mathematical statistics with aspects such as geometry, randomness and complexity playing a crucial role. Anirvan Chakraborty (IISER, Kolkata) discussed some statistical procedures to analyse such data. Stochastic approximation algorithms are a class of iterative schemes that converge to a sought value through a series of successive approximations and find application in areas such as adaptive control, signal processing, communication networks, reinforcement learning, etc. Shalabh Bhatnagar (IISc) gave an overview of stochastic approximation algorithms, and on-going and future work in the area.

Charu Lata (NISCAIR, New Delhi) discussed the role of plant growth promoting rhizobacteria (PGPR) in abiotic stress tolerance and agricultural sustainability. PGPR alter physio-biochemical as well as the molecular mechanism of plants to withstand adverse environmental conditions which are especially significant in the context of changing climate. She concluded that SN13 and RA could be formulated and used as bio-fertilizers and abiotic stress busters in rice and chickpea respectively.

The last special lecture of the event was delivered by Manindra Agrawal (IIT, Kanpur) on the hype and substance of artificial intelligence (AI). He narrated the history of AI over the years. AI began in the 1950s. The 1960s–70s saw several unmet expectations from AI, since developments in complexity theory showed that many tools were trying to solve NP-hard problems which could not be done efficiently. The 1980s saw AI become a knowledge repository that laid the foundation for advances in the area that took place in the 1990s–2000s. The 2010s has been a decade of tremendous progress that saw a profound learning revolution with techniques such as hidden Markov models and support vector machines outperforming all other AI techniques in many domains. Thus, AI has progressed in: (1) deep learning which is being applied in vision and speech, biology, games and is also expanding to new domains; (2) more modern methods like reinforced learning which are developing rapidly; (3) SAT-solvers, and (4) old methods like Bayesian learning and clustering which have also made rapid advances. Agrawal concluded that while some predictions state that computers will become more intelligent than humans by 2050 (reminiscent of the hype in the 1960s), it is not at all clear how to make the same algorithm do a large number of different types of tasks intelligently. Hence, he was of the opinion that such claims need to be taken with a pinch of salt.

Pratik Pawar* and **S. Priya***, Current Science Association, Bengaluru 560 080, India.

*e-mail: pratik@ias.ac.in;
priya@ias.ac.in