

**THE HUNDREDTH SIXTH SESSION OF INDIAN SCIENCE CONGRESS,
PHAGWARA, JALANDHAR : A BRIEF REPORT**

INAUGURAL SESSION

The 106th Indian Science Congress was held at Phagwara, Jalandhar under the auspices of the Lovely Professional University, Phagwara from January 3-7, 2019. Shri Narendra Modi, Hon'ble Prime Minister of India, inaugurated the Congress on 3rd January in the presence of Shri V. P. Singh Badnore, Hon'ble Governor of Punjab, Dr. Harsh Vardhan, Union Minister of Science and Technology, Ministry of Environment, Forest and Climate Change and Ministry of Earth Sciences, Shri V. Sampla, Minister of State for Social Justice and Empowerment in India, Shri S.S.Arora, Minister of Industries & Commerce, Govt. of Punjab, Dr. Ashok Mittal, Hon'ble Chancellor, Lovely Professional University, Phagwara. Dr. Manoj Kumar Chakrabarti, General President of ISCA delivered his address on the Focal Theme "*Future India: Science and Technology*".

After the Hon'ble Prime Minister left the dais, ISCA awards were presented to eminent scientists by Dr. Harsh Vardhan, Union Minister of Science and Technology, Ministry of Environment, Forest and Climate Change and Ministry of Earth Sciences. The inaugural session was attended by a large number of invitees including three nobel laureates, secretaries and chairman of different ministries of Government of India, foreign scientists, distinguished scientists, research scholars, students and scientists from all over the country. Senior officials of the Union and State government also attended the inaugural function.

Meeting with the Nobel Laureates:-

Inaugural session was followed by the interaction of the Hon'ble Prime Minister of India with the three Nobel Laureates in presence of Hon'ble Minister of Science & Technology, Government of India, Dr. Harsh Vardhan, Secretary, DST, Chancellor and vice chancellor, LPU and General President, ISCA.

**RASHTRIYA KISHORE VAIGYANIK SAMMELAN
(CHILDREN SCIENCE CONGRESS)**

Rashtriya Kishore Vaigyanik Sammelan (Children Science Congress) hosted jointly by Indian Science Congress Association and Lovely Professional University, Punjab with the objective of infusing and inspiring scientific temperament in the public and most importantly in the next generation was held on January 4-6, 2019. The event was supported by National Council for Science and Technology Communication, Department of Science & Technology, Government of India.

The event was inaugurated on 4th January 2019 by Hon'ble Prof. Duncan Haldane, Nobel Laureate in Physics & Professor at Princeton University, USA along with Prof. Avram Hershko,

Nobel Laureate in Chemistry and Distinguished Professor at Technion, Israel. Dr. Nisha Mendiratta, Head, National Council for Science and Technology Communication, Department of Science and Technology along with Sh. Avinash Rai Khanna, Vice Chairman, Indian Red Cross Society and Vice President of Bhartiya Janata Party were the Guest of Honour. Shri. Ashok Mittal, Chancellor, Lovely Professional University delivered welcome speech and Dr. Manoj Kumar Chakrabarti, General President, ISCA delivered Presidential address. Prof. P.P. Mathur, General Secretary (Scientific Activities) ISCA; Prof. Gangadhar, General Secretary (Membership Affairs) ISCA; Dr. Amit Krishna De, Executive Secretary, ISCA graced the ceremony with their presence. The Souvenir book containing the abstracts of the shortlisted projects was released on this occasion. Infosys ISCA Travel Awards were presented to the school children. The inauguration ceremony was attended by a huge gathering of more than 2500 young scientists, media personnel, faculty & students.

Project Exhibition of Rashtriya Kishore Vaigyanik Sammelan was also inaugurated by the esteemed guests on the same day. 110 Science projects (60 nominated by Department of Science & Technology, 15 by National Council of Educational Research and Training and 35 by Punjab State Council for Science & Technology) were put on display in the project exhibition. Students from more than 300 schools of Punjab and neighboring states also visited Project Exhibition and experienced the work done by these students.

Meet the Scientist session was also held on 4th and 5th January during which the participants of Rashtriya Kishore Vaigyanik Sammelan were able to have a great insight into how science has evolved over a period of time and what holds the future. Participants also visited Pushpa Gujral Science City on 6th January 2019

The three-day event was culminated at the Valedictory Session held on January 06, 2019. On the occasion, Chief Guest was Shri. Ashok Mittal, Chancellor, Lovely Professional University and Chairman, Organising Committee, 106th Indian Science Congress. Guest of Honor was Shri. Rajinder Singh, Scientist D, NCSTC Division, Department of Science and Technology. Dr. Manoj Kumar Chakrabarti, delivered Presidential Address. Dr Arun Kumar Pandey, Assistant Executive Secretary, ISCA concluded the session by delivering vote of thanks. The event was widely covered by all prominent media in the country.

WOMEN SCIENCE CONGRESS

The 8th Women Science Congress was inaugurated by Smt.Smirti Iraniji, Honorable Union Minister of Textiles in presence of Sh. Ashok Mittal, Chancellor, Lovely Professional University; Prof. P.P. Mathur, General Secretary (Scientific Activities) ISCA; Prof. Gangadhar, General Secretary (Membership Affairs) ISCA. Prof. Vijay Laxmi Saxena, General President Elect (2020-2021), ISCA and Dr Namita, KIRAN, DST as Guest of Honours . Dr. Manoj Kumar Chakrabarti, General President, ISCA delivered the Presidential Address.

Inauguration was followed by 14 invited lectures from accomplished women leaders and scientists and 62 contributed papers were presented in the form of posters. Invited lectures were given by Dr. Namita, Dr.Namrata and Dr.Rupashree from Department of Science and Technology and Dr.Pratiba Nair from USIEF, Ms.Suja Warrior from Infosys, Ms.Neelima Ketan from Vedanta, Ms.Sushama Oza, Director of Strategy and Sustainability, Adani Foundation,

Dr. Neelima Gupta, Vice Chancellor of CSJM University, Dr. Shakuntala Das from Potsdam State University of New York, Dr. Sagarika Biswas Sr. Principal Scientist from CSIR-Institute of Genomics and Integrative Biology and Dr. Asha Chaubey, Principal Scientist from Fermentation Technology Division of CSIR- Indian Institute of Integrative Medicine, Dr. S. Geetha from TN Agricultural University, Dr. V. Kalarani from Sri Padmavathi Mahila Visvavidyalayam and Dr. Suseela Kanduri from Synergy solutions .

The Valedictory session was by graced an inspiring deliberation of Shri Prakash Javadekar, Honorable HRD Minister Textiles, Shri. Ashok Mittal, Chancellor, Lovely Professional University and Dr. Manoj Kumar Chakrabarti, General President, ISCA delivered welcome and presidential address respectively. Prof. P.P. Mathur, General Secretary (Scientific Activities) ISCA; Prof. Gangadhar, General Secretary (Membership Affairs) ISCA and Dr Namita, KIRAN, DST. Were also present at the session. Dr G Geetha, Convener delivered Vote of Thanks.

12TH VIGYAN SANCHARAK SAMMELAN (SCIENCE COMMUNICATORS' MEET)

12th Vigyan Sancharak Sammelan (Science Communicators' Meet) , jointly hosted by Indian Science Congress Association and Lovely Professional University, Punjab with an objective of communicating the basic concepts of science amongst the common people was held on January 5-6, 2019. The event was supported by NCSTC, Department of Science & Technology, Government of India

The meet was inaugurated by Shri Ravi Shankar Prasad, Union Minister for Electronics & Information Technology and for Law & Justice on January 5, 2019 in presence of Dr. Nisha Mendiratta, Head & Advisor, NCSTC, Department of Science & Technology; Shri Ashok Mittal, Chancellor, Lovely Professional University; Shri Shwait Malik, Member of Parliament, Rajya Sabha and Shri SomParkash, MLA, Phagwara, Prof. P.P. Mathur, General Secretary (Scientific Activities) ISCA, Prof. Gangadhar, General Secretary (Membership Affairs) ISCA. Dr. Manoj Kumar Chakrabarti, General President, ISCA presided over the function. The programme was attended by a huge gathering of more than 2500 scientists, science communicators, media personnel, faculty & students

Under the broad Umbrella of "Taking Science to the People", very interesting and thought provoking invited talks were delivered by Mr. Pallava Bagla, Photo Journalist & Science Editor, New Delhi Television- NDTV & Correspondent Science Magazine , Prof. Basab Chaudhuri, Vice Chancellor, West Bengal State University, Barasat, West Bengal, Dr. Manoj Kumar Patariya, Director, CSIR-National Institute of Science Communication and Information Resources (NISCAIR), and Dr. V. Ramgopal Rao, Director, Indian Institute of Technology, Delhi.

33 Science Communicators selected by Indian Science Congress Association from all over India made the presentations in four Technical Sessions spread over two days. In addition to 18 oral presentations, 15 poster presentations were held on contemporary issues in Science & Technology communication.

The Valedictory Session was held on January 06, 2019. Shri. Ashok Mittal, Chancellor, Lovely Professional University was Chief Guest. Prof. P.P. Mathur, General Secretary (Scientific Activities) ISCA and Shri. Rajinder Singh, Scientist D, NCSTC Division, Department of Science and Technology were present. Dr. Manoj Kumar Chakrabarti, General President, ISCA presided over the function. The Meet concluded with Vote of Thanks by Dr. Amit Krishna De, Executive Secretary, ISCA.

SCIENCE EXHIBITION : PRIDE OF INDIA EXPO

“Pride of India” (PoI) Expo, is the Mega Science Exhibition showcasing the cutting-edge technologies, leading scientific products and services, path breaking R&D initiatives, schemes and achievements of India’s foremost and leading public and private sectors, central and state government departments, research labs, educational institutions, corporate, defence etc. Apart from thousands of national and international delegates, prominent R&D heads, policy makers, bureaucrats, senior scientists, ICT & allied industry leaders, technocrats & academicians, innovators, entrepreneurs, social activists, top executives from corporate & industry, the PoI Expo was visited by thousands of fervent students and general public during 3 to 7 January 2019.

The PoI Expo was spread over an area of approx 20,000 sqm with the participation of 150 organizations. The expo was a display of cutting-edge technologies, leading scientific products and services, path breaking R&D initiatives and achievements of India’s foremost and leading public and private sector, government departments, PSUs, research labs, educational institutions, corporate, defence etc. Shri V. P. Singh Badnore, Hon’ble Governor of Punjab and Dr. Harsh Vardhan, Hon’ble Union Minister for Science and Technology and Earth Sciences inaugurated the Expo in presence of Shri Ashok Mittal, Chancellor, LPU and Dr. Manoj Kumar Chakrabarti, General President, ISCA.

Vigyan Jyot : Flame of Knowledge, is a novel initiative to popularize science and encourage it as a career amongst the youth, thus preparing scientists and innovators of tomorrow. Vigyan Jyot was ceremoniously received at the sprawling campus of LPU by Dr Manoj Kumar Chakrabarti, General President ISCA, Dr Ashok Mittal, Chancellor Lovely Professional University, Dr. Ashok Saxena Former General President and other dignitaries on 02 January 2019. Vigyan Jyot was lit at the venue of PoI Expo at the hands of Shri V. P. Singh Badnore, Hon’ble Governor of Punjab and Dr. Harsh Vardhan, Hon’ble Union Minister for Science and Technology and Earth Sciences and was kept lit throughout the 5 days of the event inspiring thousands of students.

On the concluding day of ISC, during the Valedictory Function, the Vigyan Jyot was ceremoniously handed over by Dr. Manoj Kumar Chakrabarty to Prof. K. S. Rangappa , General President Elect with the message of further spreading the importance of science amongst the students and taking the Vigyan Jyot to the venue of 107th ISC.

VALEDICTORY

The Valedictory marking the end of the event of 106th Indian Science Congress was held on 7th January 2019. The dignitaries for the function were Shri Ashok Mittal, Hon'ble Chancellor of Lovely Professional University, , Prof K.S.Rangappa ,General President (Elect), Dr. Ashok Kumar Saxena, Former General President, ISCA. On this occasion, Young Scientist Awards and Best Poster Awards were also presented. Mrs. Rashmi Mittal, Pro Chancellor LPU, Prof. Gangadhar, General Secretary (Membership Affairs), ISCA, and Prof. P.P. Mathur, General Secretary (Scientific Activities) and Dr Amit Krishna De, Executive Secretary, ISCA were also present. Dr.Manoj Kumar Chakrabarti ,General President, ISCA delivered Presidential address

The Vigyan Jyot was ceremoniously handed over by Dr. Manoj Kumar Chakrabarti to Prof. K.S. Rangappa, with the message of further spreading the importance of science amongst the students and taking the VigyanJyot to the venue of 107th ISC.

PLENARY SESSIONS:

LECTURE OF NOBEL LAUREATES

Prof. Thomas Sudoph	<i>Why we need basic research for precision medicine: the neuroscience example</i>
Prof. Avram Hershko	<i>The ubiquitin system for protein degradation: roles in health and disease</i>
Prof. Duncan M Haldane	<i>Topological Quantum Matter, Entanglement, and a "Second quantum Revolution</i>

PLENARY ON THE ACHIEVEMENT OF AGRICULTURAL RESEARCH IN INDIA

Dr. J.K. Jena	<i>New vistas in aquaculture development in India for income, employment and nutritional security</i>
Dr Ashok K. Patra	<i>Soil, food security and human health</i>
Prof. Ramesh Kanwar	<i>Climate change and its impact on water security and food security: Policy issues.</i>

PLENARY ON RESTLESS TIDE: CONTINUING CHALLENGE OF INFECTIOUS DISEASES IN INDIA

Dr. O.P. Yadav	<i>Agricultural development at arid zone area</i>
Dr. Amit Ghosh	<i>Restless tide: continuing challenge of infectious diseases in India</i>
Prof. Seyed E. Hasnain	<i>To fulfill our pm's dream to eradicate TB from India by 2025 we need to have multipronged approach</i>
Prof. Arunaloke Chakrabarti	<i>Stop neglecting fungi</i>
Dr. Hemanta K. Majumder	<i>Leishmania, an old enemy: a "mania" of three decades</i>

PLENARY ON APPLIED CATALYTIC CONVERSIONS FOR SUSTAINABLE CHEMISTRY AND THERAPEUTICS.

- Prof. Ananda Singh *Functionalization of ii-systems for developing new routes to heterocycles and fluorinated molecules*
- Prof. Jitendra A. Bera *Double dehydrogenation of primary amines to nitriles*
- Prof. S S V Ramasastry *New approaches for the construction of fused cyclopentanes*
- Prof. Sandeep Verma *Catalyzed release of therapeutic gases in neurons*

PLENARY ON DIABETES

- Prof. Satinath Mukhopadhyay *An introduction to Diabetes*
- Prof. Richard I.G. Holt *The emerging ultra-long acting basal insulin: translating clinical trials into real-world evidence*
- Prof. Loretta Vileikyte Boulton *Diabetic complications prevention and cure*
- Prof. Andrew JM Boulton *Diabetic foot care*

PLENARY OF SECRETARY, DHR AND DG, ICMR ON NON COMMUNICABLE DISEASES

- Prof. Balram Bhaugam *Problem of noncommunicable diseases in India*
- Prof. G.K. Rath *Key achievements in cancer care at the national level and the future road map*
- Prof. Nikhil Tandon *Diabetes, obesity and other cardio Metabolic conditions*
- Prof. P.N. Sylaja *Neurosciences: Keu achievements at national level and future road map*
- Dr. Prashant Mathur *Achievement in cancer research*

PLENARY ON CLIMATE CHANGE AND HEALTH

- Dr. Shanta Datta *Overview on climate change and health*
- Prof. V.M. Katoch *Facing the challenge of climate change on human health in India*
- Dr. Gautam Goswami *Impact of climate change on health – technology perspective*
- Dr. Jaiprakash Narain *Climate change and it' simpact on human health*

PLENARY ON TRANSLATIONAL RESEARCH IN REPRODUCTION & GENETICS

- Prof. A. Zubuik P. Ebokai *Impact of environmental pollution on reproductive function and metabolic disorders: influence of natural products/ phytochemical*
- Prof. Andy Peterson *A shared journey in human genetics in south Asia*
- Prof. Ren-Shen Ge *Recent studies of stem leydig cells*

SPECIAL LECTURE

Prof. Pulok Mukherjee *Bio-prospecting of natural products: learning from our ancestors - tradition to trend*

PLENARY ON NOVEL THERAPEUTIC APPROACHES FOR BREAST CANCER

Prof. Harikrishna Nakshatri *Impact of race/ethnicity on normal breast and breast cancer biology*
Prof. Srikant Anant *Magnolia component honokiol, a traditional Chinese /ayurvedic/native american medicine targets stem cells in colon cancer to inhibit tumorigenesis*
Prof. Roy A. Jensen *Components of the traditional chinese herbal medicine thunder god vine, triptolide and celastrol target hsp90 to prevent triple negative breast cancer*

PLENARY ON NOVEL CHEMO PREVENTIVE AND CHEMO THERAPEUTIC APPROACHES AGAINST CANCER

Prof. Rita Ghosh *Quinone detoxification and development of aggressive prostate cancer*
Prof. Addanki P. Kumar *Intervention strategies for chemo-radio-resistant pathways*
Prof. Animesh Dhar *Novel combination of natural compounds derived from unani /ayurvedic medicine target numerous genes in super-enhancer regions in pancreatic cancer, in turn, inhibit tumorigenesis*
Dr. Subhrajit Saha *Modulation of unfolded protein response to promote chemo-sensitization*

PLENARY OF 125TH ANNIVERSARY OF SATYENDRANATH BOSE, PRASANTA CHANDRA MAHALANABIS AND MEGHNAD SAHA

Prof. Dilip Kumar Sinha *125th anniversary of Satyendranath Bose, Prasanta Chandra Mahalanabis And Meghnad Saha*
Prof. S.K. Midya *Few works on ionization after Professor Meghnad Saha from University of Calcutta*
Prof. Bhupati Naidu *Popular contributions of P.C. Mahalanobis to statistical science and indian nation*

PLENARY ON RECENT TRENDS OF RESEARCH IN NEURODEGENERATIVE DISEASES

Prof. Dipak Sarkar *Neuronal activation of proopiomelanocortin ameliorates aging altered*

- hepatic glucose metabolism*
- Prof. Shilpa Buch *Evs in neurodegenerative diseases*
- Prof. Tusharkanti Ghosh *Peripheral immune responses are altered in animal models of alzheimers disease*
- Prof. Rajat Sandhir *Molecular and biochemical trajectories from diabetes to alzheimer's disease*

PLENARY ON CUTTING EDGE TECHNOLOGY FOR THE WELFARE OF HUMAN SOCIETY

- Dr. Harish C. Pant *A novel translational approach to neurodegenerative diseases: a small peptide derived from neuronal cell cycle kinase (cdk5) provides a protective and restorative role in neurodegenerative diseases like alzheimer disease(ad), parkinson's (pd).*
- Dr. Prasad D.K. Dhulipala *Recombinant enzymes for hydrogen sulfide mitigation in oil and gas industry*
- Prof. Devendra Agrawal *Mechanisms and biomarkers of plaque rupture*

PLENARY ON RECENT ADVANCEMENT IN ECOLOGICAL SCIENCES

- Dr. (Mrs.) B. Meenakumari *Convention on biological diversity and biological diversity act 2002, in conserving India's bioresources*
- Dr. S. Faizi *Biodiversity and poverty eradication: Reforming the forest biodiversity management regime*

PLENARY ON RESEARCH ON NUCLEAR MEDICINE

- Prof. Shantanu Pande *Pet ct in cardiac surgery: ally in clinical dilemma and unraveling unexplored*
- Dr. Amitabh Arya *Nuclear medicine- the future of medicine*
- Prof. T.K. Kalawat *Nuclear medicine – the future of medicine*

PLENARY ON INDIANS MAJOR STRENGTH AND OPPORTUNITIES ON NGS DATA ANALYSIS THROUGH BIOINFORMATICS AND COMPUTATIONAL BIOLOGY

- Dr. T. Madhan Mohan *Major distributed bioinformatics network in India: - strength and opportunities for bio- bigdata analytics*
- Dr. G. Narahari Sastry *Drug repurposing for rare diseases: a data science and modeling driven approach*
- Dr. Alope Srivastava *Ngs data analysis: strength and challenges in India*
- Dr. Amrita Ravi *Doctor's diary: solving high impact problems with technology*

PLENARY ON CHALLENGES OF UNIVERSAL SALT IODIZATION

Prof. Amar K. Chandra	<i>Iodine supplementation: a boon or bane in public health</i>
Prof. Umesh Kapil	<i>Suitability of double fortified salt in India: review of scientific evidence</i>
Prof. John H Lazarus	<i>The challenge of iodine nutrition</i>
Prof. Elizabeth N Pearce	<i>Iodine nutrition in pregnant women</i>

INDUSTRY ACADEMIA MEET

Industry Academia meet was organized to the tie between academics and industries so that the innovative ideas and products developed by academics can be transferred to the Industries. This meet was attended by a large number of delegates, Inaugural program was enlightened the thought provoking takes from the chancellor, LPU, General President, ISCA and CEO's of different Industries.

Participant of the program were enriched by the lectures of several bright academicians and experts from Industries.

106TH INDIAN SCIENCE CONGRESS, JALANDHAR RECOMMENDATIONS FROM SECTIONS

SECTION : Agriculture and Forestry Sciences

- Coarse cereals having high nutritive value and climate resilience: Untapped genetic resources of these crops need to be exploited and such crops are to be popularized through value addition, value chain development, institutional facilities and policy support and popularization.
- To make rice based cropping system sustainable available advance technologies on water use efficiency, nutrient use efficiency, climate resilient varieties and rice straw management needs to be translated and implemented through appropriate policies support and popularization. Crop diversification using crops like maize needs to be popularized with appropriate policy support like procurement, storage facilities etc.
- Pulse crops with phenotype plasticity are adaptable to diverse climatic conditions and can cover up the rice fallow area. Creating seed hubs, ensuring good quality seeds, increasing MSP and market integration can revolutionize pulse production.
- Integrated farming system is the most suitable approach across India to double farmers income, mitigate effects of climate changes, enhance food nutritional and environmental security.
- Horticultural crops mainly fruits and vegetables which are rich in antioxidants and nutraceuticals and field crops like maize can play an important role in crop diversification especially in paddy based cropping system.

- Infrastructure development for irrigation facilities, conservation of rain water for augmenting water resources and its effective utilization through participating water management in irrigated and rain fed areas are the need of the hour.
- Farming has improved over time but not the conditions of the farmers. Policy interventions should target the farmers and consumers through effectively linking them with appropriate technology back stopping.

SECTION : Animal, Veterinary and Fishery Sciences

- Basic biology should be made integral part of undergraduate and post graduate studies in biotechnology, microbiology, bioinformatics and other modern biology disciplines.
- With a view to conserve biodiversity, emphasis on strengthening of classical zoology in the syllabus of undergraduate and post graduate programmes be given which is not reflected in new UGC syllabus. UGC may be requested to restructure the syllabus in the light of this recommendation with special reference to minor phyla.
- National funding agencies should provide sufficient funding for research on animal taxonomy as classical taxonomy has gone on backfoot during last 2 decades and proper identification of species of biodiversity importance has become a problem for young researchers.
- Bio-resources are the wonderful gift of the nature to the mankind whose sustainability can be effectively linked to rural livelihood and economic development, so science education should aim at attracting students for proper management and sustainable utilization and innovative idea of bio-resources.
- The assemblage of species with which we share the planet represent a vast untapped genetic library, with undiscovered pharmaceuticals and other beneficial substances. So programmes needed to be initiated for the exploration of other less known potential varieties of life forms with a view to ensure rural livelihood, food, health and financial security for future.
- Ensuring dangers of climate changes to biodiversity be recognized and integrating measures be undertaken on priority to conserve the biodiversity.
- Biotechnological tools and innovative ideas should be used for the conservation, management and restoration of all types of habitats.

- Checklist of local fauna be prepared to know the status of biodiversity and submit the same to the concerned agency to undertake conservational measure.
- Emphasis must be enhanced in the form of the major research findings to harnessing more animal protein from the aquatic resources to ease out pressure on land resources.
- There is an urgent need to increase researches to maintain and manage better health of terrestrial and aquatic animal resource for providing energy rich protein and other resources to human beings.
- In order to augment the inland fishery production, there is a dire need for investigating mortality among the early life history stages of fishes and to develop innovative methods to increase the year class strength under prevailing conditions.
- The damaged breeding site of the fishes should be conserved and restored to enhance the recruitment of fishes in natural aquatic ecosystem.
- Due to the construction of multi-purpose dams on the rivers of our country, the sections where indigenous species have declined should be stocked with young ones of similar species annually in these riverine system which were affected greatly by this anthropogenic influences.

SECTION : Anthropological and Behavioural Sciences (including Archaeology, Psychology, Education and Military Sciences)

- Strengthen the health system response to NCDS including diabetes and metabolic syndromes in various ethnic groups in India at primary care level which will help in better health management.
- To enact ethical code of conduct to study among indigenous and other population in respect of anthropological and behavioral studies.
- Exploring media, visual and tourism anthropology is required in understanding different cultures and centers in India.
- To explore and excavate various prehistoric sites in India are required for understanding human evolutionary behaviors.
- Involvement of anthropology in policy planning towards various tribal development programmes.

- Scientific intervention through large scale population specific beta-thalassemia carrier screening in all indentified high risk zone for the disease.
- Ancestry based family screening for beta-thalassemia would be a practical approach for identification and counseling the carriers in high risk communities.
- After ensuring the preservation of rich, indigenous cultural heritage of the tribal's, planning for their improvement of their quality of life, wellbeing & economic status should be enhanced. Thus, efforts should be made to bring them into main stream and also to protect their rich indigenous heritage.

SECTION : Earth System Sciences

1. Geoscientific research findings need to be utilized by the mineral and mining based industries for the National development.
2. With the increase in demand of Energy and Water there is an urgent need to formulate research strategies and investigation modalities for their optimum utilization and management. More emphasis is to be given to nuclear energy as few promising Uranium and Thorium ore reserves have been reported and discussed in this congress.
3. With the development of advanced geophysical technology, the blind ore bodies and hidden ore bodies by thick soil cover, thin Deccan lava flows and by the Upper Gondwana sediments need to be revisited. To enhance mineral and energy resources, ongoing research activities in the Indo-Gangetic cover, Bay of Bengal, Arabian Sea and Indian oceans require rigorous investigations. The Antarctica and gas hydrate related researches need to be continued with more emphasis on the Climate Change.
4. There is an urgent need to re-look into ground-water management and mitigation. Geoscientific perspectives for Natural Hazards such as earthquakes, floods, cyclones, storms, tsunamis, mass movements, ground level fluctuations and Climate Change need to be evaluated in the light of cutting edge technology.
5. More detailed geotechnical investigations are necessary in order to plan dams for irrigation; bridges, tunnels, new railway lines and national highways to connect metros, state capitals and Smart Cities. Emerging challenges come from the landslides and mass wasting processes operative in the Himalayan terrain that needs special attention with a more skilled scientific work force.
6. Restructuring of the Geology and Geophysics courses for graduate and post-graduate students is necessary so as to cater needs of the industries and research organizations. Exploration for groundwater, building material and raw material and raw material for

small scale industries he taught under the skill development short-term courses in various Indian Universities.

SECTION : Engineering Science

- Indigenous Technologies as its specialties to the context of India needs to be highlighted with focus on Energy efficiency. Restoration of natural resources, Environmental protection practices and Skill enhancement and employment generation using skilled workforce.
- Sustainable Technology Development is to be coupled with Green economy and Moral and Ethical practices.
- Shifting of Hydrocarbon Economy (non-Renewable Energies) to Hydrogen Economy (Renewable and Fuel Cells) needs to be emphasized.
- Water and Wastewater Technologies, Solid and E-waste Management requires special attention.
- Nation Centric, innovation driven, Knowledge intensive and globally benchmarked Rural Technologies needs special attention.

SECTION : Environmental Sciences

- Environment boundaries do not respect political boundaries therefore transboundary initiative (i.e. across state/nations) need to be promoted by way of improved regional cooperation for understanding implications of environmental changes and developing mitigation strategies.
- Pan-India or the regional scenarios on different aspects of environment are required for future projections and planning for mitigation and adaptation programme.
- Multidisciplinary integrated studies on priority issues, such as, livelihoods promotion, water and air pollution management, biodiversity conservation and sustainable use, degraded land restoration, etc., should be promoted.
- Climate sensitive regions like the Himalaya and the Western Ghats must be considered as national priority for action on impact mitigation, adaptation and sustainable development.
- Basic research is key for planning and processes of application and therefore, there is a need to promote and integrate basic research with the applied research.
- There should be a provision of environmental and biodiversity payment services and that need to be linked with the livelihood of the people so that they could better conserve and manage their resources.
- Awareness on different environmental and biodiversity issues is the key for conservation and management of natural resources.

- Implementations of policies and framework in right perspectives is needed for conservation and sustainable utilization of natural resources.

SECTION: Information and Communication Science and Technology (including Computer Sciences)

- ICT can be explored to enhance the productivity and preservation of agricultural goods.
- GIS can be effectively used to forecast weather and natural disasters.
- Initiations to be taken for indigenous solution towards Health Care Sector, Using ICT.
- Effective case of ICT to implement innovative ideas for green computing/technology.
- The advantage of ICT can be explored for the development of ‘Smart Cities’ & ‘Smart Villages’.
- ICT may be explored to enhance the ethical values for society.
- More initiatives to be taken to increase/expertise in various domains of ICT.

SECTION : Mathematical Sciences (including Statistics)

Mathematics curriculum should be reoriented in all levels, including school, college and university curriculums, keeping in mind about the advances in science and technology across the globe. Recent report by MHRD reveals that mathematics has the highest failure in class 10 State Board Examinations. It is therefore recommended that a well-defined methodology should be found to impart mathematics. Particularly, mathematics learning should be made joyful and meaningful at the school level. Creating visual representations for students can open up understanding and interest on this subject. At the higher level, equal priority should be given both in pure and applied mathematics.

Our honorable Prime Minister in his inaugural speech of 106th Indian Science Congress has stressed on interdisciplinary research. Mathematics is probably the only subject that can be used extensively in all branches of science and technology. The following interdisciplinary topics should be given immediate attention for the betterment of science and technology.

- **Mathematics in Biology** : Mathematics has profound applications in biological sciences. Mathematical biology is the fastest growing research field in mathematical sciences throughout the world. However, the scenario in India is not so impressive. To keep pace with rest of the developed countries, both mathematicians and biologists of our country should work in complimentary fashion. Our Universities and Institutes should encourage and put extra efforts to

do research in biomathematics and systems biology to better understand and explain complex biological phenomena.

- **Mathematics in Meteorology :** Mathematics plays a pivotal role in predicting climate change and weather forecasting. Mathematical meteorology is truly an interdisciplinary topic that involves mathematicians, physicists and geologists. Sophisticated computational techniques, like numerical methods, stochastic processes, data analysis, are indispensable parts for accurate weather prediction and extreme events. Keeping in mind the great variation in temperature and precipitation in India, future research should be aimed at the intersection of mathematics and meteorology for the sustainable development of our country.
- **Big Data Analysis :** One of the most challenging tasks to the present days scientists, including mathematicians, is to analyze the big complex data set, uncover the hidden information in it and give insights about the trend and future. This big data analysis may be particularly important and useful in healthcare, meteorology, stock market, agriculture industries and other sectors. Despite its potential applications and usefulness, big data analysis for the benefit of aforesaid fields in India is lacking. Immediate attention and necessary impetus should be given to generate and use big data for the overall societal benefits of the nation. There is, however, a huge challenge for the scientists in terms of data collection, data modeling, data sharing, data storage and data protection to make this mission successful.

In addition to these, significant stress should be given in the topics like applied functional analysis, algebraic geometry, graph theory, complex analysis, operations research, mathematical physics, computational fluid dynamics and numerical computations.

SECTION : Medical Sciences (including Physiology)

- Application of occupational health and Ergonomics can be used to improve the occupational health of the workforce of the country by humanization of work and work environment. Thus the drudgery of the workers may be lessened and productivity of the agricultural and industrial sector can be enhanced for the development of India. It is recommended that the quantum of research in this field should be increased in universities, research institutes, and engineering institutes throughout the India. This discipline should be introduced in the curriculum of undergraduate and postgraduate courses in relevant disciplines of science and engineering. Every large and medium industry should have Occupational health experts and Ergonomists.

- It may be pointed out that there is no comprehensive physiological database in India. The national physiological database has immense importance for identifying the pathological conditions of the patients of any country. The database will be helpful for the pathologists and medical practitioner for diagnosing diseases and treatment. The problem may be solved by establishing a ‘PHYSIOLOGICAL SURVEY OF INDIA’ which can take appropriate steps for forming physiological database at national level.
- In India there is increasing trends of life threatening diseases like, diabetes, cancer, AIDS and others. It is very much required to study the prevalence of such diseases in different populations and geographical regions so that proper health planning can be undertaken by the Govt. for particular disease in different areas of the country. In addition to that it is needed to understand the molecular basis of such diseases. Therefore, more research should be undertaken considering the socioeconomic and nutritional status of the population.
- The Govt. should undertake appropriate health policy for eradication of some prevalent diseases and for improving the general health of the people.
- More research is also required for the drug development considering the socioeconomic condition of the people of India. It is very much essential to emphasize for development of low cost medicine for a large section of population in India.
- Medical Colleges should have both Medical and basic physiologists which will strengthen both teaching and research component of the Colleges.

SECTION : New Biology (including Biochemistry, Biophysics & Molecular Biology and Biotechnology)

- The knowledge in the New Biology domain termed as “Modern Biology” is changing fast to understand the biological system as a whole. Dynamic curriculum in this area integrating basic biology, chemistry, physics, mathematics, computation and statistics for understanding the functional biology should be introduced in the under-graduate and post-graduate curriculum with special emphasis on related practical and training.
- The integrated collaborative research among the different areas of science should be stressed in both basic and applied research to understand the biological system at molecular level in detail for development of precision medicine.
- Simulation of research in the areas of functional genomics, proteomics, metabolomics and interplay of different cellular proteins/pathway should be focused to facilitate targeted drug discovery associated with health and food production.
- System should be developed to encourage the innovative potential among the researchers to solve different biological problems.

SECTION : Physical Sciences

- Special interact session must be planned with the concerned discipline students, faculty and staff with the Nobel Laureates to inspire them to do innovative research.
- To aware the students, faculties and staff of academics about the new technological advances Training/ workshop should be organized in a large scale throughout the country.

SECTION : Plant Sciences

- There is need to strengthen teaching of Core botany with respect to systematic and structural botany to develop strong knowledge base and produce young scientific force.
- Due emphasis needs to be given on better understanding of form and structure, including morphological and molecular architecture, and reproductive biology to explore enhanced opportunities for genetic manipulation to realize desirable and designer plant types.
- Studies on organization and function of cellular structures and vacuoles for better understanding of uptake of nutrients and non-nutrients, and carbon sequestration deserves due attention of the funding agencies.
- In order to achieve genomic manipulation to develop novel genomic combinations and genome restructuring it is desirable to lay due emphasis on elucidation of structural organization of genome and genome analysis in near and distant relatives.
- Whereas a large number of phytomolecules have been explored as a source of phyto-medicines, but lot more needs to be done to explore newer applications, including identification of allelochemicals, biopesticides befitting to newer cropping systems, and in curing of degenerative diseases using newer model systems such as *Caenorhabditis elegans* and *Drosophila*.