



Shri Siddaramaiah
Hon'ble Chief Minister
Government of Karnataka

VIJNANA VAHINI

April 01, 2023 to September 30, 2023



Shri N. S. Bosaraju
Hon'ble Minister for Minor Irrigation and
Science & Technology
Government of Karnataka



KARNATAKA SCIENCE AND TECHNOLOGY ACADEMY
DEPARTMENT OF SCIENCE AND TECHNOLOGY, GOVERNMENT OF KARNATAKA

REVIEW OF KSTA BY THE HON'BLE MINISTER FOR S&T

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Hon'ble Minister for Minor Irrigation and Science and Technology, Shri N. S. Bhoose Raju reviewed the progress of activities and programmes of KSTA. Shri A. B. Basavaraju, Director (Technical), Department of Electronics, Information Technology, Biotechnology and Science & Technology and Managing Director, KSTePS, was present in the meeting. Dr. A. M. Ramesh, Chief Executive Officer, KSTA briefed the Hon'ble minister about the programmes of the academy.



KSTA AWARDS, FELLOWSHIPS AND ASSOCIATESHIP

KSTA is providing fellowships, and young professionals in the field of institutional memberships and science and technology, and science associateship to recognize the communication/popularization. contributions of academicians, researchers, engineers, technologists

KSTA AWARDS, FELLOWSHIPS AND ASSOCIATESHIP *continued.....***Lifetime Achievement Award**

In order to recognise outstanding contributions in areas of Science, Technology, Engineering, Agriculture & Medicine (STEAM) and excellence in STEAM Communication as an outreach to benefit the society, KSTA has instituted Prof. C. N. R. Rao - KSTA Lifetime Achievement Award in STEAM and Lifetime Achievement Award for STEAM Communication in Kannada. Applications received in response to the call for nominations for 2023 awards are being scrutinised and final selection will be made through an expert committee with due approvals from EC, KSTA.

Fellowships

Based on recognizable individual merit and contribution to STEAM, KSTA Awards Fellowships in 12 domains of Science, Technology, Agriculture and Medicine. Applications received in response to the call for nominations for Fellowships 2023 are being scrutinised and final selection will be made through an expert committee with due approvals from EC, KSTA.

Associateship and Memberships

Academics/Researchers/Teachers/Practitioners in any branch of Science, Technology, Engineering, Agriculture and Medicine, working or retired from Educational/Research and related organisations including Corporate, are being admitted as Associates. Individuals who are desirous of becoming Associates of KSTA may do so by paying a fee of ₹ 1,000/- (Rupees One thousand only), and submitting a duly filled in application form available in the KSTA website (www.kstacademy.in) throughout the year. Till September 2023, 104 applicants have been admitted as Associates.

MOU AND COLLABORATIONS

KSTA has been collaborating with various colleges, institutions and universities to conduct various activities and programmes of mutual interest with each other with the following objectives:

- Inculcating scientific temper across civil society through science communication
- Facilitating technology dissemination through Academia-Farm-Industry interface, with a focus on rural areas
- Fostering innovations and entrepreneurship for societal benefits
- Organising conferences & outreach programmes
- Capacity building in frontier areas of Science & Technology

During the period April – September 2023, MOU with the following four organisations/institutions were signed and till date 60 MOUs have been signed with organisations/institutions:

Sl. No.	Organisations/Institutions	Date of MOU
1	Mount Carmel College, Autonomous, Bengaluru	17-04-2023
2	Sri Bhagawan Mahaveer Jain First Grade College, KGF	24-05-2023
3	Nagarjuna College of Management Studies, Bengaluru	27-05-2023
4	Neural Oasis AI Studios LLP, Bengaluru	03-07-2023

ALL ABOUT HUMAN BRAIN

Nadoja Dr. P.S. Shankar

Lord Byron has said that the dome of thought and the palace of the soul is in the head. It gets the credit because it contains a wonderful organ- the Brain- which is considered 'a monument where human knowledge is engraved!'

Human brain is the most complex structure in the body and its intricate development has enabled man to rise to the supreme commanding position in the world. It consists of innumerable nerve cells and their fibers. It weighs around 1300 Gms and the weight has no relation with the mental capacity of the individual.

Though the brain weighs only 1/50th of the total body weight, it requires 1/5th of blood pumped out of the heart during every beat and its requirement of oxygen and glucose is very high. There has to be a continuous supply of these vital substances for its activity. Any curtailment in this supply leads to death of the cells and loss of consciousness and paralysis of the body. Nature has taken adequate precaution to maintain a constant blood supply to the brain. There are two arteries arising from the aorta and they pass on either side of the neck and reach the base of the brain. Two other branches from the arm vessels pass through the backbone as vertebral arteries and reach the base of the brain where they unite in the form of a round loop and supply blood to the different parts of the brain. On branching the vessels do not communicate with each other and are called end-arteries. Hence any curtailment or obstruction in the blood supply will have deleterious effect.

Our intelligence, memory and thinking are located in definite parts of the brain. The sensations are perceived and interpreted here. Our behavior and personality are influenced by its activity; and all our experiences are preserved here. Often brain is compared to the telephone exchange. A variety of

information will be reaching it constantly and it sorts them out. It takes decisions quickly and communicates it through motor system and exhibits a suitable response. It is a common experience while walking, if we place our foot on a thorn or even on a soft thing in night, we withdraw the foot quickly or while driving a car if somebody comes in front suddenly, we press the brakes immediately. Though the foot feels or eyes observe these abnormal sensations, the impulses reach the brain which in turn sends out the signals to the foot to act quickly. When we are awake, a variety of information from the eyes, ears, tongue, nose and the skin reaches the brain and brain processes and interprets them. Then we appreciate discretely them as sight, sound, taste, smell or sensation of touch, pain or temperature.

The brain is well protected in the thick bony skull case and it consists of cerebrum, cerebellum and brain-stem. The cerebrum occupies most of the region. It forms the highest controlling centre. It is made up of two hemispheres which are separated by a deep fissure; however, both halves are connected by a bridge of white fibre matter-corpora collosum. The soft structures of both halves are of similar size and shape. The hemisphere presents many intricate folds and deep grooves.

Each hemisphere has been divided into important lobes like frontal in the front, occipital in the back, parietal above and temporal in the sides. They have different functions. The visual impressions gathered through the eyes are interpreted in the occipital lobes and it enables us to recognize the size, shape and colour of the objects. Hence this lobe is the real eye. In the temporal lobe, the centres concerned with hearing and speech are located. The power of speech has taken the man to a supreme position among living beings.

The frontal lobes are important for voluntary movement, expressive language and for managing higher level executive functions. They are important for processing and interpreting somatosensory input. For example, they inform us about objects in our external environment through touch (i.e., physical contact with skin) and about the position and movement of our body parts (proprioception). The parietal lobes are also responsible for integrating sensory input, and construction of a spatial coordinate system to represent the world around us. The parietal lobe is vital for sensory perception and integration, including the management of taste, hearing, sight, touch, and smell

Though the cerebral hemispheres are alike, the speech centre is located in the left side in the right-handed individuals, and vice-versa. You might have observed the loss of ability to speak in right-handed individuals having paralysis of the right side of the body. It is because the seat of the disease lies in the left hemisphere. In a majority of individuals the left hemisphere functions as the dominant hemisphere. The taste sensations are recognized in the parietal lobe and it is through this region we can feel the consistency, size, shape and weight of a substance kept in the hand even without seeing it. The frontal lobes are concerned with our higher functions like judgment and decision, reasoning, emotion and control, imagination and a variety of abilities of the mind.

The important nerve cells are located in the outer part of the gray matter of cerebrum and the inner white matter is made up of nerve fibres. These cells control the functions of various muscles and glands and are connected with the spinal cord through the brain stem.

There are 12 pairs of cranial nerves which have direct connection with the brain. They have been numbered serially. They are sensory, motor, and mixed. There are nerves carrying sense of smell, sight, sound, taste and general sensations from face and scalp and throat. Other nerves supply the muscles of the eye, jaw, facial expression, neck and tongue. The tenth nerve is not confined to the mouth cavity and it descends into the chest and abdomen and it is concerned with the acts of swallowing, talking, slowing of the heart rate and movements of the stomach.

The midbrain, pons and medulla oblongata

together like a stalk form the brain stem and the spinal cord emerges like a tail through a big opening in the base of the skull. The medulla oblongata appears as the expanded end of the spinal cord and it is connected with the pons above. The nerve centres in the medulla control the involuntary functions of the heart, respiration, and swallowing. It is in this region the nerve fibres controlling the movement of the body cross to the opposite side. Because of this the right cerebrum controls the movement of the left side of the body and vice-versa. The fibres from the cerebellum and cerebrum pass through the pons and it has also the nuclei of sixth and seventh cranial nerves.

The midbrain is situated between the pons and cerebrum. It acts as a relay station for the sensory impulses. The sensations from different parts of the body terminate in thalamus deep in the brain. The nerves coming from the eyes meet in the midbrain and the fibres in the middle of the nerve cross to the opposite side. There are also collection of nerve cells regulating the body temperature, appetite, wakefulness, sleep, water balance and sexual urge.

The little brain, cerebellum is situated in the back of the skull below and behind the cerebrum. It has two lobes and exhibits many narrow folds simulating a kisan's turban. A bridge of tissue connects the two lobes. This highly cellular structure is connected with cerebral hemispheres above and spinal cord below. It co-ordinates all the movements performed by different groups of muscles. It maintains our balance, while standing and while walking.

We use our brain for all our activities and thinking. Goldsmith in his poem 'Deserted village' has summed up its functions as 'And still they gaz'd, and still the wonder grew: that one small head could carry all he knows'.

- Nadoja Dr P S Shankar

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LATEST DEVELOPMENTS IN SCIENCE AND TECHNOLOGY**New enzyme – PET46 for Plastic degradation**

Every year nearly 400 million tons (MT) of plastic waste is being generated worldwide. India generates around 3.4 MT of plastic waste annually. While, Karnataka generates around 0.296 MT every year. Major contribution of plastic to our State comes from Bengaluru which generates around 600 tons of plastic waste every day and that amounts to 0.22 MT per year.

The plastic pollution is increasingly affecting us with severe health, environmental, social and economic consequences. We have been successful in handling only 10% of the plastic waste generated through the 3Rs - Reduce, Reuse, Recycle approach. Hence, governments, researchers, industry and other stakeholders are exploring other methods for solving plastic problem.

A research group under the guidance of Professor Ruth Schmitz-Streit at German's Christian-Albrechts Kiel University has shown, for the first time, that microorganisms from the deep sea have the potential to degrade polymers such as Polyethylene terephthalate (PET) commonly called as PET. The research group have highlighted the special feature of the PET degrading enzyme in their recently published paper in the *Communication Chemistry* journal. The research group have discovered a new genetic resource from deep-sea belonging to the archaea and described this PET degradation enzyme as PET46.

Although, 80 different PET degrading enzymes were known, most of which were found in bacteria or fungi. However, the present research contributes to a better understanding of the ecological role of deep-sea archaea and the possible degradation of PET waste in sea.

The PET46 has many unusual properties and



structurally, the enzyme differs significantly from those previously discovered. It has the ability to degrade both very long-chain PET molecules, known as polymers and short-chain PET molecules, known as oligomers, which means that degradation can be continuous.

Among other things, PET46 uses a completely different mechanism for substrate binding. An unusual 'lid' of 45 amino acids above the enzyme's active center are crucial for binding. The biochemical properties of PET 46 make it a very interesting enzyme both for marine and terrestrial plastics degradation. The PET46 is found to be more efficient at 70°C when compare to other enzymes

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Reference: Pablo Perez-Garcia et al, An archaeal lid-containing feruloyl esterase degrades polyethylene terephthalate, *Communications Chemistry* (2023). DOI: [10.1038/s42004-023-00998-z](https://doi.org/10.1038/s42004-023-00998-z) Journal information: [Communications Chemistry](https://www.nature.com/commchem)

New hope for treating paralysis after spinal cord injury

A research team from University of California, Federal Institute of Technology, Swiss and Harvard University have successfully restored the functional activity after spinal cord injury. The research team published their findings in Science journal in September 21, 2023.

The same team had suggested a treatment method to trigger the axons, the tiny fibers that link nerve cells, to regrow after spinal cord injury in rodents and demonstrated that nerve fibers can be regenerated after spinal cord injuries in their publication in Nature journal in 2018.

When the spinal cords of mice and humans are partially damaged, the initial paralysis is followed by the extensive, spontaneous recovery of motor function. However, after a complete spinal cord injury, this natural repair of the spinal cord doesn't occur and there is no recovery. Meaningful recovery after severe injuries requires strategies that promote the regeneration of nerve fibers. Their observations using single-cell nuclear RNA sequencing not only exposed the specific axons that must regenerate, but also revealed that these axons must reconnect to their natural targets to restore motor function.

The team, in their new study published in Science, first used advanced genetic analysis to identify nerve cell groups that enable walking improvement after a partial spinal cord injury. Then used chemical signals to attract and guide the regeneration of these axons to their natural target region in the lumbar spinal cord. Mice with anatomically complete spinal cord injuries regained the ability to walk, exhibiting gait patterns that resembled those quantified in mice that resumed walking naturally after partial injuries. This observation revealed a previously unknown condition for regenerative therapies to be



Credit: Pixabay/CCO Public Domain

successful in restoring motor function after neurotrauma.

The research team opined that the study will unlock the framework to achieve meaningful repair of the injured spinal cord and may expedite repair after other forms of central nervous system injury and disease. The research team hope that the understanding and re-establishing the projections of specific neuronal subpopulations to their natural target regions holds significant promise for the development of therapies aimed at restoring neurological functions in larger animals and humans.

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Reference: Jordan W. Squair et al, Recovery of walking after paralysis by regenerating characterized neurons to their natural target region, Science (2023).

PROGRAMS CARRIED OUT DURING 2ND & 3RD QUARTERS (APRIL - SEPTEMBER 2023)

Workshop On "Cyber Security & Its Importance in Educational Institutions"

KSTA, in association with Karnataka State Higher Education Council, organised a two-day workshop on "Cyber Security and Its Importance in Educational Institutions" on 15 & 16 June 2023. A total of 96 participants from various Universities/Colleges/Educational Institutions across the State participated in this workshop. The workshop had expert talks related to Cyber Security & Supply Chain Risk Management, Cyber Intelligence, Cyber Terrorism and Cyber Forensics, Cyber Security for Mobile devices, Online Research and publications, Cyber Security for Universities and Academic Institutions, Cyber Security in Drones, Mobility and Aerospace, Career opportunities in Cyber Security.



The workshop was inaugurated by Col. Prof. Y.S. Siddegowda, Hon'ble Vice Chairman, Karnataka State Higher Education Council and Dr. Rajeev Chetwani, Director, Directorate of Information Systems Program Office, ISRO, Bengaluru graced the occasion as the Chief Guests. Dr. A. M. Ramesh, CEO, KSTA presided over the function. Eminent scientists/technocrats delivered talk on cyber security during the technical sessions. At the valedictory function, Sri Sreenath Ratnakumar, Scientist, ISRO graced the occasion as the Chief Guest.

Urban Management and Water Conservation Workshop

KSTA actively participated in the organisation of a state-level conference titled "Urban Management and Water Conservation" to commemorate the Platinum Jubilee of Raman Research Institute (RRI) and the Silver Jubilee of Environment Association Bangalore (EAB) at RRI Campus. As a part of the program, KSTA had organised state-level essay competition on the theme "Green Cities for Sustainable Future" in Kannada and English for undergraduate and postgraduate science students, and a quiz competition was also organised. The conference was attended by around 150 participants comprising of research students, faculty and researchers from various educational institutions and universities. The conference was inaugurated by Dr. Prakash Chauhan, Director, National Remote Sensing Centre, Hyderabad. Dr. Souradeep, Director, Raman Research Institute was the Guest of Honour. EAB President Dr. R. G. Nadadur, Secretary Sri Bhaskar Murthy and Administrative Officer of RRI Shri V. S. Naresh were also present.



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Intellectual Property Rights and Entrepreneurship Development

KSTA, in collaboration with Karnataka State Council for Science and Technology (KSCST), organized a five-day faculty development programme on 'Intellectual Property Rights and Entrepreneurship Development' during July 11 to 15, 2023. The program was restricted to around 40 participants. The program was inaugurated by Dr. U.T. Vijay, Executive Secretary, KSCST, while Dr. A M Ramesh, CEO, KSTA presided over the function.



Audio – Video Editing Training Workshop

KSTA organized a Five-day certification program on "Audio-Video Editing" for students, research scholars, teaching faculty and general public during August 29 - September 02, 2023 at KSTA premises. The intake was restricted to 40 participants for better interaction and to aid effective practical sessions.

The program was inaugurated by Dr. Noor Samad Abbalagere, Agricultural Officer, Commissionerate of Agriculture, Bengaluru/Science Writer/Film Actor/ DD Chandana News Anchor. Sri Vilas K., Young Film Director graced the occasion as the Chief Guest, while Dr. A.M. Ramesh, CEO, KSTA presided over the function.



STEM Fair

KSTA organized a science programme titled "STEM FAIR" (Science, Technology, Engineering & Mathematics) from May 16 to 18, 2023. More than 350 high school and pre-university students participated in the programme. As a part of the program, Mobile Planetarium Shows, Space on Wheel, Science Films and 3D Scitech Movies Shows, as well as science model exhibition competitions were organized.



The best models were awarded with cash prizes and certificate. The event was inaugurated by Dr. Bikram Pradhan, Scientist, ISTRAC, a subsidiary organisation of ISRO. Shri H. L. Srinivas, URSC, ISRO was the Guest of Honor. Dr. A M Ramesh, CEO, KSTA presided over the inaugural function.

Digital Content Generation for high school students

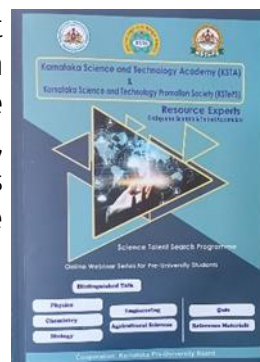
Digital teaching & learning contents are being developed for the high school students in Physics, Chemistry, Mathematics and Biology as per the Karnataka Secondary Education Examination Board (KSEEB) syllabus and are being distributed in the form of DVD to the selected Government High Schools across the State. DVDs comprising of 22 lecture/experiments were posted to 350 Schools



PUBLICATIONS

Compendium of Webinar Lectures

KSTA, in association with KSTePS, is conducting Science Talent Search Program for Pre-University Students. A compendium of 184 pages comprising of 125 talks delivered by the resource experts on various topics in field of Physics, Chemistry, Mathematics, Biology, Engineering and Agriculture was presented in August 2023. Around 400 copies of the same are being distributed to program beneficiary students



Biotechnology Laboratory Manual

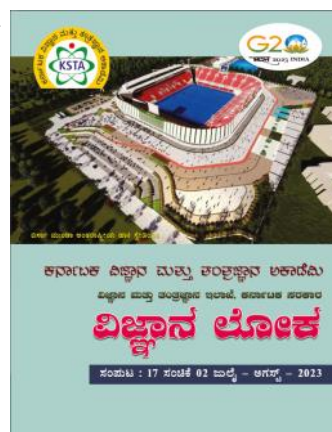
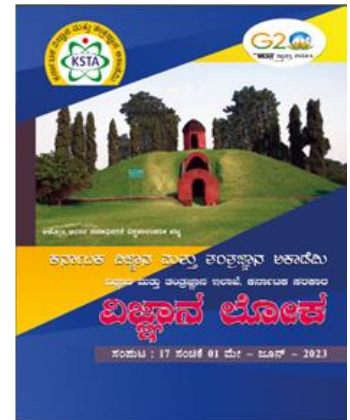
KSTA organized a Skill Vigyan Program in Life sciences/ Biotechnology, a Faculty Training Program, sponsored by the Department of Biotechnology (DBT), Ministry of Science & Technology, Govt. of India through Karnataka Innovation and Technology Society (KITS), a unit of Dept. of Electronics, Information Science, Biotechnology & Science and Technology, Government of Karnataka for the benefit of Pre-University Lecturers, Researchers and Faculty members from Colleges, Universities and Research Institutions from the State of Karnataka. A laboratory manual comprising various experiments conducted during the training workshop was published.



Vijnana Loka – Bimonthly Magazine

Vijnanal Loka issues for the month of April, June, August & September were published and sent to subscribers including pre-university and science degree colleges, science centers, libraries and other organizations across the state. The e-copy of the same are available on KSTA website.

One can get the hard copy through subscription. Please fill your details in the subscription form available on the website and send the same along with payment details to our email: vijnanaloka@gmail.com



Subscription	Individual	Institution
Each	Rs. 50/-	-
Annual	Rs. 300/-	Rs. 500/-
3 Years	Rs. 875/-	Rs. 1500/-

Subscription details are as follows:

Account Name: Karnataka Science and Technology Academy
 Bank: State Bank of India
 A/c No. 64001018807
 IFSC: SBIN0009045
 Branch: Vidyaranyapura
 UPI ID: KSTABANGALORE@SBI

SCAN & PAY



Study Visits to KSTA

KSTA has a science park, a studio and a state-of-the-art auditorium at its premises. An opportunity is being provided to school and college students to visit KSTA and its facilities. During these visits, science films and 3D shows on science subject are being screened. Also, various out door models help students to understand scientific concepts through hands-on, minds-on way of learning.

Live streaming of Chandrayan 3 Vikram Lander Landing

Live streaming of Chandrayan 3 soft landing on moon was organised on August 23, 2023. Around 115 pre-university students witnessed the soft landing of Vikram Lander on moon



Visit of Sri Swamy Vivekananda Higher Primary School, Bengaluru

About 140 High School students from Sri Swamy Vivekananda Higher Primary School visited KSTA on September 06, 2023. Students are guided to understand the various concepts of science and technology using various out door models through hands-on, minds-on way of learning.



Upcoming Programs in FY 2023-24

National Conference on Climate Resilience and Sustainable Development: KSTA is organizing a National Conference on "Climate Resilience and Sustainable Development" during 22-24 November 2023. The conference will have distinguished talks by eminent domain experts on topics related to the focal theme. The conference delegates include postgraduate students, research scholars, teaching faculty, and scientists from across the Country. An opportunity is being provided to delegates to present their research papers and working models that align with the focal theme. Four best research papers and working models each will be selected and awarded cash prizes and a certificate of recognition.

The last date for submission of an extended abstract of the paper/working model is November 16, 2023 (Thursday). The selected authors will be invited to make presentation in the conference. Further, the selected papers will be published in a special journal with an ISBN number. Fill in the google form (<https://forms.gle/VBZdYHcawb4uU9Jb9>) and register.

Digital Content Generation, Production of Science Capsules, Short Feature Films /Clippings : Development of digital information in frontier areas of science and technology. Production of teaching and learning resources and distribution of the same to educational institutions in the backward areas through DVD/CD.

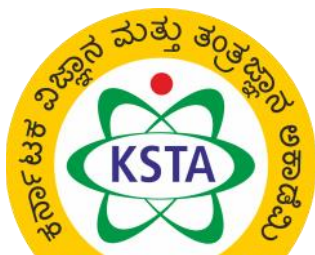
Vijnana Loka - Bimonthly Magazine: During 3rd & 4th quarter of FY 2023-'24, three issues will be published and posted to pre-university and science degree colleges, science centres, libraries and other organizations across the state.

Innovation Award for UG, PG and General Public: Prof. U. R. Rao award for PG students and Dr. S. K. Shivakumar award for UG students. The Award carry a cash prize of Rs 10,000 and a certificate. Please visit KSTA website for details.

Other Programs

Policy, Strategy, Approach and Status Papers; Membership and Fellowship; Collaborative programs & MOU

Note: Depending upon the availability of funds and decisions of EC, above programs will be implemented.



SCIENCE & TECHNOLOGY FOR ALL

KSTA, a Unit of the Department of Science and Technology, Government of Karnataka, established on 5th September, 2005, has been mandated for science promotion and popularisation in the State. KSTA has the Vision of 'Nurturing and Enabling Science & Technology for All' and Mission of 'Playing a pivotal role in Science promotion, Technology dissemination and fostering Innovations for Societal welfare'. The Objectives of the KSTA are to inculcate scientific temper across the civil society through science communication, particularly in Kannada; facilitate technology dissemination through Academia-Farm-Industry interface, with a focus on rural areas; foster Innovations & Entrepreneurship for Societal benefits; recognise talents and contributions through Awards; organise Conferences & Outreach programmes; serve as Resource Centre for Capacity building in frontier areas of Science & Technology; and act as a Science, Technology & Innovation Policy (STI) Advisory Body for the State.

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Dr. Anand R, Senior Scientific Officer, KSTA

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