

# KARNATAKA SCIENCE AND TECHNOLOGY ACADEMY

DEPARTMENT OF SCIENCE AND TECHNOLOGY, GOVERNMENT OF KARNATAKA

# Vijnana Vahini

*Nahin Vijnanena Sadrusam*

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Science & Technology for All

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## From Chairman's Desk

As we come to the close of the year 2020 that has become synonymous with the Covid-19 pandemic, the strengths and solutions of science and technology also became evident, from 'tracing to treatment'. It has also been the year faced with challenges, to charter new paths. The National Education Policy (NEP-2020) unveiled during the year, followed wide ranging discussions across the country for new possibilities and opportunities. Further, the Science, Technology, Innovation Policy (STIP-2020) being formulated with multi-stakeholder consultations is also on the anvil.

Every organisation looks forward to new horizons, duly considering the mandate, resources, needs and potentials, to achieve excellence along with relevance. With a decade to go for the time frame of SDGs, it was felt an opportune moment to draw up a Vision for the Academy to realise the aspirations of the State with reference to major economic activities as well as societal ambience.

The Vision-2030 document has been formulated, with the goals of: Appreciation of science as innate rather than external, among the stakeholders for



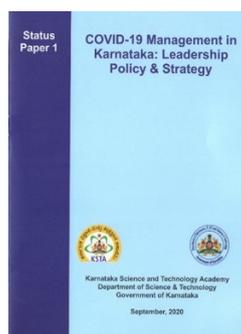
**Prof. S. Ayyappan**

the desired ownership at all levels of society; Scientific literacy and technological capabilities for rural Karnataka; Facilitating experience of the S&T benefits first hand in daily lives; Coordinating the extraordinary institutional and human capital in the State; Enabling leadership role for the State in Science including research publications and public goods; Establishing STI-based novel enterprises and Partnerships; Building Interdisciplinary Consortia and Networks; Policy prescriptions for enhancing investments, both public and corporate.

I am sure this will be a reference document for the plans and programmes of the Academy for times to come.

- S. Ayyappan

## COVID-19 Management in Karnataka: Leadership Policy & Strategy



The entire world is grappling with novel coronavirus pandemic, which is wreaking havoc on lives and livelihoods. Apart from an unprecedented human toll, COVID-

19 has triggered an unfathomable economic crisis.

Extraordinary situations like the pandemic call for an effective leadership in order to ensure effective coordination among various sections of the health care and public services in particular and society at large.

The Government of Karnataka has been

.....Continued in Page 5



Prof. D. Channe Gowda

“Polymers are the backbone of four major industries viz. plastics, elastomers, fibers and paints & varnishes”

### Life is Polymeric in Nature !!!

The number of polymers used by range of new materials. A bullet proof mankind in daily life is countless. The material like polycarbonate which daily life have not been easier and combines the transparency of glass and colourful without the discovery and the strength of steel is one such varied applications of polymers. Use of example. In future, we can expect even polymers in the manufacture of plastic more formidable utility combinations to buckets, cup and saucers, children's emerge as the polymer chemist becomes toys, packaging bags, synthetic clothing an even better 'architect of molecules'. materials, automobile tyres, gears and seals, electrical insulating materials and machine part has completely

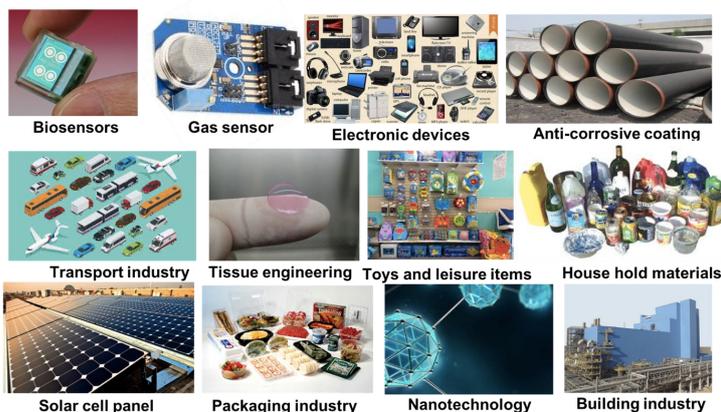


Fig 1. Multidimensional applications of polymers

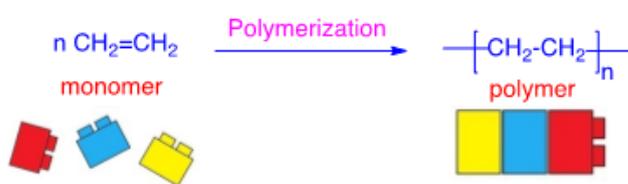
revolutionized the daily life as well as the industrial scenario (Fig 1). In fact, the polymers are the backbone of four major industries viz. plastics, elastomers, fibers and paints & varnishes. Even living systems are made up of various complex molecules (polymers) like carbohydrates, proteins, nucleic acids, lipids, etc.

Polymers have not been discovered overnight. They came out of long and persevering studies by a host of motivated scientists whose work has enriched human life. Today, the overall insight into polymer science and technology is so deep that a material scientist can create an almost limitless

Polymers are compounds of very high molecular weight ( $10^3$ - $10^7$ u) formed by the combination of a large number of simple molecules or monomers. All polymers are macromolecules. Polymers are obtained through chemical reaction of monomers. Monomers have the ability to react with another molecule of same type or different type in a suitable condition to form the polymer chain. This process in nature has resulted

in the formation of natural polymers while the synthetic polymers are made. Today, the polymer industry has rapidly developed and is larger than the copper, steel, aluminium and some other industries combined.

The orientation of monomers and obtaining high molecular weight polymers is very important in polymer chemistry. The proper oriented polymers are stronger than steel and very good conductor of electricity. Conducting power is even more than that of copper. Dyneema, the strongest commercially available fabric is an oriented polyethylene polymer. Its molecular weight is 100 times greater than that of high density polyethylene (HDPE). A rope made of Dyneema can lift almost 60000 kg while steel rope of similar size fails before the weight reaches 6500kg. The



introduction of Zeigler-Natta catalyst [Et<sub>3</sub>Al:TiCl<sub>4</sub> in 1:1 ratio] by Karl Ziegler and Giulio Natta has brought about a revolution in the field of polymerisation by producing highly oriented and high molecular weight polymers which led them to receive Nobel Prize.

Polymers are classified as natural, synthetic and semi-synthetic based on source; fibres, elastomers and plastics based on the kinds of intermolecular forces present in the molecules of polymers and homo and co-polymers based on the nature of monomers present in the polymers. The polymers may be natural or synthetic, inorganic or organic, they have numerous applications in our daily life.

Organic polymers play a crucial role in living things providing basic structural materials and participating in vital life processes. The solid parts of all plants are made up of polymers viz. cellulose, lignins and various resins. Wood resins are polymers of simple hydrocarbon, isoprene. Another familiar isoprene polymer is rubber. Other important natural polymers include proteins which are the polymers of amino acids; and nucleic acids which are polymers of nucleotides - complex molecules composed of nitrogen containing bases, sugar and phosphoric acid. Starch, important source of food energy derived from plants are natural polymers composed of glucose. Glycogen, storage food of animals is also polymer of glucose. Graphite and diamond, both composed of carbon are inorganic natural polymers.

Synthetic polymers are produced in different types of reactions like addition and condensation. They may follow free radical, cationic and anionic or coordination mechanism. The man-made polymers (synthetic) synthesized are countless. It include polyethylene, polypropylene, polystyrene, polyvinyl chloride (PVC), polytetrafluoroethylene (PTFE, TEFLON), polyacrylonitrile (PAN, orlon), phenol-formaldehyde resin (bakelite, Novolac), melamine-formaldehyde resin, urea-formaldehyde resin, polymethyl methacrylates (PMMA), polyesters (terylene or dacron or mylar), glyptal, nylons, epoxy resins,

polycarbonates, vulcanised rubber (ebonite), neoprene, Buna-N, Buna-S, butyl rubber, polyurethane rubber, etc. The most important representation of inorganic synthetic polymer family are the silicones and glasses.

The polymers find applications in various types of fields and to mention a few:

- ◆ Agricultural field: mulching films, greenhouse films, etc.
- ◆ Medical field: syringes, capsules, medicine packaging, etc.
- ◆ Transport field: car bumpers, wheel covers, etc.
- ◆ Electrical field: wire crating, switches, etc.
- ◆ Household applications: bowls, kitchen accessory, etc.
- ◆ Specialty Polymers: aeroplanes, etc.

The greatness about polymers is that we want to use polymers to make stuff rather than wood, metal, glass or ceramics. Most polymers are lighter, harder to break, long lasting, recyclable, easier to form into shape, safe, non-toxic and cheaper. Also by choosing the right kind of polymer, our products can be soft or hard, flexible or stiff or anything we want. Most polymers will last a long, long time. That's good - especially if it is used to make clothes, jars, even chairs, etc. But it's bad when polymers get thrown away. Some polymers are easier to recycle than others. It's important to recycle the polymer products so that our landfills don't get filled up so fast.

The largest application of synthetic polymers is as plastic. Portion of it is used as throwaway containers and packaging materials. Plastic do not degrade by themselves i.e., they are non-biodegradable. These polymers create pollution as there are grater chances of environmental damage. So most of the countries including India are banning the use of plastic. Plastics are threat to animal life especially the marine world since their environment is full of plastic which adversely affect their natural habitats and also are responsible for the death of animals mainly because of suffocation. Since plastics are manufactured from petroleum which brings a

**“Organic polymers play a crucial role in living things providing basic structural materials and participating in vital life processes”**

### Life is Polymeric in Nature !!! *Continued.....*

host of issues like destruction of habitat, extraction of crude oil, security issues, chemical manipulation, etc., (Fig 2).

This is not supposed to happen because this development utilizes man power of intellectual as well as lot of funding. Further, this does not mean to say that plastic has no place in society but its proper use, disposal and maintenance will leave the society healthier. Hence, instead of banning the use of plastic, research should continue

they did not serve the purpose. Therefore, a proper planning is highly essential before putting any idea in place as the learned people say that "proper planned work is half done".

All in all it may be taken into consideration that some polymers (like plastic) as on today cannot be banned completely disregarding their multidimensional applications which is the need of the hour. May be it has become a part of human life today but in



**Fig 2.** Abuse and mis use of plastic (polymers) is highly taxing to human life

to find out the solution of their coming days people should be wise so degradation. In this sense, a good also the authorities should take planning is highly essential and also vital necessary steps and precautions. One such example for the execution of product with lack of planning is the case of LHRH (luteinizing hormone releasing hormone).

In 1980's, most of the laboratories across the globe were busy synthesizing LHRH analogues to control the fertility. Scientists succeeded in synthesizing the antagonists to inhibit the LH and FSH which are responsible for fertility. But they never thought about the side effects what if LH (luteinizing hormone) and FSH (follicle-stimulating hormone) were not released? As a result, when these hormones are inhibited, side effects like oedema formation took place which led to lot of complications. Eventually, the analogues found way toward the sink as

To conclude, our lives have become beautiful, meaningful and colourful as the mother Nature has bestowed us with such magnanimous gift called "polymers" and we the humans should be responsible to tactfully handle them now and leave the rest to future also.

**Prof. D. Channe Gowda**

Member, KSTA

Former Chairman, Department of  
Studies & Research in Chemistry,  
University of Mysore,  
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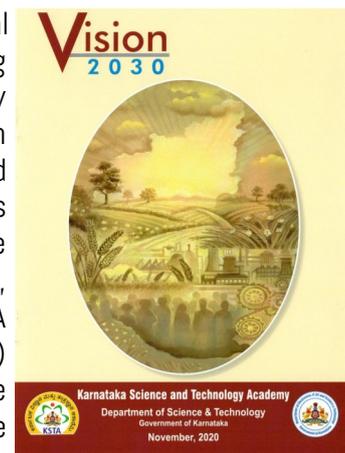
#### **KSTA meetings**

Executive Committee (EC): The 11th EC meeting of KSTA was held on December 23, 2020 under the Chairmanship of Prof. S. Ayyappan, Chairman, KSTA from 3:00am to 5:00pm

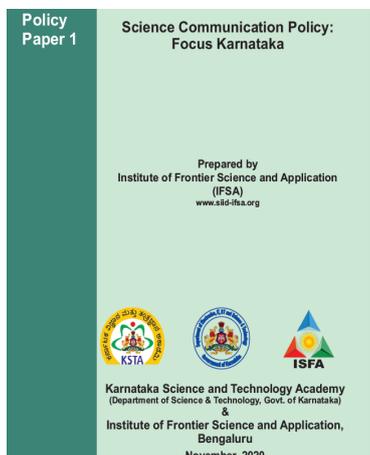
*"Our lives have become beautiful, meaningful and colourful as the mother Nature has bestowed us with such magnanimous gift called "polymers" and we the humans should be responsible to tactfully handle them"*

**Vision 2030**

Karnataka is in the forefront with regard to scientific and technological institutions as well as science popularisation and promotional centers, including KSTA, functioning since 2005. With transformational changes happening in every segment of economy across the world, India is also looking forward for youth empowerment through the recently unveiled National Education Policy-2020 and forthcoming National Science, Technology Innovation Policy-2020. The emphasis is on 'Skills for 21 Century with a Global canvass'. Hence, this is an opportune moment to formulate a Vision for the Karnataka Science and Technology Academy, aligning with the Sustainable Development Goals, that are intended for 2030. KSTA is visioning the next decade for STI (Science, Technology & Innovations) acceptance, appreciation and adoption. Keeping a decade as a time frame for the document, it is necessary to formulate the Vision-2030, with due reference to the resources potentials as well as aspirations of people of the State.



**Science Communication Policy: Focus Karnataka**



Effective science communication is critical to improve science literacy, and to accelerate development of a knowledge society through eradication of superstitions and blind beliefs, leading to better adaptation of science and technology and ease of implementation of science-based interventions.

Karnataka Science and Technology Academy (KSTA), in association with the Institute of Frontier Science and Application (IFSA), has taken an initiative to develop a Policy Paper with the vision of Development of an Implementable and Inclusive Science Communication Policy for infusion of science and scientific temper in all walks of life and for all social strata. While most issues in science communication in India are generic, there are also several regional issues. The document provides specific recommendations with focus on Karnataka.

Samarth Bharat depend crucially on effective science communication to different sections of the population. However, while literacy levels are increasing, scientific literacy is still quite low. Effective science

**COVID-19 Management in Karnataka: Leadership Policy & Strategy ..... continued from Front Page**

endeavoring to address the COVID-19 pandemic with a multi-pronged approach incorporating science, technology, infrastructure, public services and the whole of society, with detection, treatment, rehabilitation and communication.

The Leadership role of the Hon'ble Chief Minister Shri B. S. Yediyurappa and the Hon'ble Deputy Chief Minister Dr Ashwath Narayan, C.N was visible throughout, with the national media interviewing the latter on several occasions, with regard to the management strategy in the State.

The Karnataka Science and Technology Academy, prepared this Status Paper on 'Leadership Policy & Strategy', bringing out the perceptions and responses to the COVID-19 pandemic, at the highest level in the

Government. Government of Karnataka has demonstrated an unparalleled vision, coordination and action with regard to the COVID-19 management, that can set an example for the country.

This Status Paper is being presented as a knowledge base with practical approaches, for managing critical situations in the Society, where leadership has played a pivotal role, with regard to both policy and strategy. Karnataka, with an edge with regard to Science & Technology in the whole country, has been able to project the immense potentials, when combined with an Innovative Leadership, and this publication is expected to be a reference document for all States.

### Programs carried out during Third Quarter (October - December 2020) of FY 2020—'21

During October - December 2020, Seventeen programs related to frontier areas of science and technology were conducted through Video Conference (VC) mode in association with research institutes/ science forum/ educational organizations.

Sl. No.	Date	Topic	Association	No. of Participants
1	September 22-25, 2020	Recent Trends in Biotechnology	Sheshadripuram First Grade College, Yelahanka	60
2	October 27, 2020	Monthly Science Lecture Series – 03 "Plastic Technology & Opportunities"	Gravity Science Foundation, Chamarajanagara	125
3	November 2-3, 2020	KSTA Nobel Prize Lecture Series – 2020	KSTA	100
4	November 7, 2020	Special Talk on Sir C V Raman Birth Anniversary	Gravity Science Foundation, Chamarajanagara	167
5	November 17, 2020	Career Opportunities in Breast Cancer & Counselling	Garden City University, Bengaluru	100
6	November 18, 2020	Career Opportunities in Clinical Data Management	Garden City University, Bengaluru	177
7	November 19, 2020	Career opportunities in Bioinformatics	Garden City University, Bengaluru	177
8	November 20, 2020	Career opportunities in Pharmaceutical Industry	Garden City University, Bengaluru	177
9	November 21, 2020	Monthly Science Lecture Series – 04 : on "Climate Change: Sources, Impact and Management"	Gravity Science Foundation, Chamarajanagara	108
10	November 24-26, 2020	Three Days National webinar on "Physical Chemistry"	SSCASC ,Tumukur and B.V. Bhoomaraddi College of Arts, Science and Commerce, Bidar	80
11	December 5, 2020	World Soil Day Webinar -"Soil Day Importance & Conservation of Soil"	KSTA	145
12	December 8-11, 2020	Intellectual Property Rights	KSCST & SRN Adarsha College, Bengaluru	326
13	December 10, 2020	Disaster Management: Effects of COVID 19 on different sectors	Garden City University, Bengaluru	160
14	December 18, 2020	Introduction to Forensic Science and its scope	Garden City University, Bengaluru	160
15	December 19, 2020	Monthly Science Lecture Series -5: Artificial Intelligence and Its Applications	Gravity Science Foundation, Chamarajanagara	145
16	December 22-24, 2020	Srinivasa Ramanujan Memorial Lecture Series	Surana College, Bengaluru and Pawate Institute of Mathematical Sciences, Karnatak University, Dharwad	188
17	December 23-24, 2020	International Webinar on Soil Conservation & Land use Planning - Geospatial Solutions	Department of Geography, Bangalore University	

### MOU and Collaborations

MOU with 07 organisations/institutions were signed with the following purpose and scope:

- 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

Sl. No.	Organisations/Institutions	Date of MOU
1	Institute of Health Management Research, Bengaluru	08.09.2020
2	Shri Jagadguru Chandrashekaranaatha Swamiji Institute of Technology, Chikkaballapura—562101	10.09.2020
3	Garden City University, Bengaluru	25.09.2020
4	Srinivasa University, Mukka, Mangaluru—574146	06.10.2020

Sl. No.	Organisations/Institutions	Date of MOU
5	MIET (Mangalore Institute of Technology & Engineering), Moodabidri	17.10.2020
6	CSIR – Central Institute of Medicinal and Aromatic Plants (CSIR-CMAP), Bengaluru	9.11.2020
7	Karnataka State Higher Education Academy, Dharwad	26.11.2020

**Current Science & Technology**

- Dr. Anand R, Senior Scientific Officer, KSTA

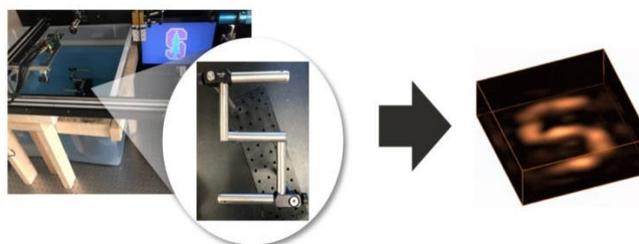
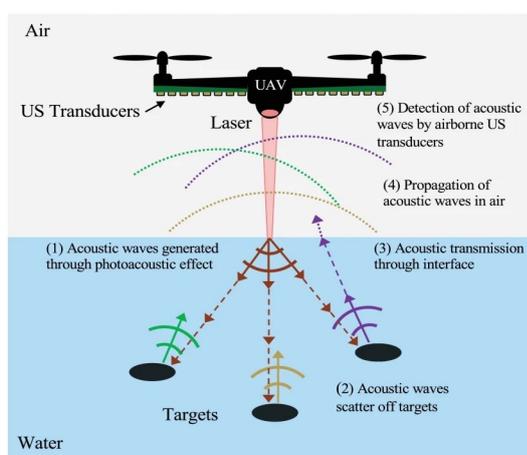
**A light and sound integrated aerial sonar system for deep ocean studies**

As we all know, the study of the ocean and its floor by existing technology is limited to only 5% of the total global waters. At present sonar is the primary contributor to existing underwater imagery, the water-based system is limited in spatial coverage due to its low imaging output. On the other hand, aerial synthetic aperture radar systems which has the capability of penetrating clouds have provided high-resolution imaging of the entire earth’s landscapes but are incapable of deep penetration into water.

Stanford University engineers Aidan Fitzpatrick, Ajay Singhvi and Amin Arbabian have developed an

airborne method for imaging underwater objects by combining light and sound. The Airborne Sonar System could be installed beneath drones to enable aerial underwater surveys and high-resolution mapping of the deep ocean. Most underwater mapping has been achieved by attaching sonar systems to ships that sail a given region of interest. But this technique is slow and costly, and inefficient for covering large areas.

University engineers have expressed their hope and envisage that their light and Sound integrated aerial sonar system one day being used to conduct drone-based biological marine surveys from the air, carry out large-scale aerial searches of sunken ships and planes, and map the ocean depths with a similar speed and level of detail as Earth’s landscapes.



**New Way of Ordering the Elements Proposed**

Last year we celebrated the 150th anniversary of the Periodic of Table Elements. The concept of arranging elements was created by the Russian chemist, Dmitry Mendeleev (1834-1907) in the year 1869.

Mendeleev’s periodic table consists of elements listed on the basis of the same chemical properties. Later in the beginning of 20th century, after the understanding and the development of quantum theory, the list of elements was updated according to the atomic number (number of protons) leading to the



.....Continued in the next page

development of the modern periodic table. Most text as hardness or magnetic behavior.

books during 1940s had a periodic table that we This work, published in the Journal of Physical Chemistry, involves assigning Mendeleev Number see today.

This periodic table may be an iconic method of (MN) to each element as in other previous listing elements. However, elements with less proposals. There are several methods of getting MN chemical similarity are placed side by side in this and in there's recent study they used two basic table and some elements found in the same column quantities that can be measured directly, an atomic do not reflect any close relationships - for example, radius of an element and a property called carbon and lead. electronegativity ( $\chi$ ) which describes how strongly an atom attracts electrons to itself.

Zaheed Allahyari and Artem Oganov of the Skolkovo Institute of Science and Technology in Moscow have proposed a new method of listing elements. In this method elements are arranged in the same linear order, with a slight change in the properties between each sequence pair. Using this structure, it is possible to predict which simple compounds have the same properties and also help to identify new objects with useful properties such

## Upcoming programs/publications

### Best Book Award in Science, Agriculture, Technology & Medicine

In order to encourage publication of Kannada books in the field of agriculture, science, technology and medicine, KSTA has been providing best book award for the selected books once in two years. Authors may submit 04 copies of books published during January, 2019 to November 2020 for the award. The last date for submission is January 11, 2020. For further details visit KSTA website.

### *Vijnana Loka* — Bimonthly Magazine

The Nov-Dec 2020 issue of *Vijnanaloka* is ready. Till now 2000 copies of each issue is being printed and distributed free of cost to pre-university and science degree colleges, science centres, libraries and other organizations across the state. All the issues are made available in KSTA website. Interested researchers may send articles for publication.

### Small Grant/Short term Study

Supports for Workshops, Symposia and Seminars, and also short term Studies, to spread scientific awareness, specially among students; introduce teaching faculty to new horizons of Science & Technology; create awareness on contemporary issues related to Science & Society will be provided. The last date for submission is January 11, 2020. For further details visit KSTA website.

### Video Lecture Competition

To provide an opportunity for Students, Teachers, Researchers and Scholars and the general public to exhibit their knowledge, creativity, analytical and presentation and communication skills "Ten Minutes to Fame: Video Lecture Competition is being organized. Send your video to our email: [video.ksta@gmail.com](mailto:video.ksta@gmail.com) The last date for submission is January 11, 2020. For further details visit KSTA website.

**Upcoming programs/publications *Continued*.....****Innovation Award for UG, PG and General Public**

Exemplary innovations / solutions emanating from Science & Technology or any segment of economy that have helped transform the lives of people, particularly in rural areas or have enabled enterprises and employment would be recognised and awarded. The Award carry a cash prize of Rs 10,000 and a certificate. The last date for submission is January 11, 2020. For further details visit KSTA website.

**Innovation Platform**

In order to capture innovations, both institutional and individual, the Karnataka Science and Technology Academy has established an Innovation Platform. The aims of the program are exploring and documenting grass root innovations in different sectors, mentoring for further refinements and applications, establish Innovation-Industry-Business linkages and to provide a platform for innovators for IP protection, validation and scale up. The last date for submission is January 11, 2020. For further details visit KSTA website.

**Essay Competition for UG, PG and General Public**

Essay writing competition in Kannada and English is being conducted for Under Graduate, Post Graduate and General Public. Last date of Submission is January 11, 2021. Send your essay to our email-essay.ksta@gmail.com. For further details visit KSTA website. The topics for 2020 competition are as follows.

ಪದವಿ ಹಂತ Under Graduate Level	ಸ್ನಾತಕೋತ್ತರ ಹಂತ Post Graduate Level	ಜನಸಾಮಾನ್ಯರಿಗೆ General Public
ಕೋವಿಡ್ 19 ನಂತರದ ಸಾಮಾಜಿಕ-ಆರ್ಥಿಕ ಸವಾಲುಗಳು Post Covid 19: Socio-economic Challenges	ಕೋವಿಡ್ 19 ನಂತರದ ಆರ್ಥಿಕ ಪುನಶ್ಚೇತನದಲ್ಲಿ ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನಗಳ ಪಾತ್ರ Post Covid 19: Role of Science and Technology in Economic Revival	ಕೋವಿಡ್ 19: ಭವಿಷ್ಯಕ್ಕೆ ಪಾಠ Covid 19: Lessons for the Future

**Science & Technology for All****Contact****Chief Executive Officer**

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