Science & Technology for All

From Chairman's Desk

At a time when we went through the second wave of the Covid-19, science has again assumed centre stage in our pandemic management. From testing to treatment, efforts have employed several S&T tools along with innovations. These have given hope for overcoming the crisis, when we all need to be joining hands in the new normal ways of communication and transactions.

After the major event of inauguration of the Trainers' Training Centre and the Awards ceremony during March, 2021, the KSTA got into the planning of activities for the coming financial year, 2021-22. Along with a series of webinars focusing on current issues including the pandemic, a lecture series by the KSTA Lifetime Achievement Awardees commemorating the 75th Indian Independence Day, titled as '*Bharata Swatantra Amruta*
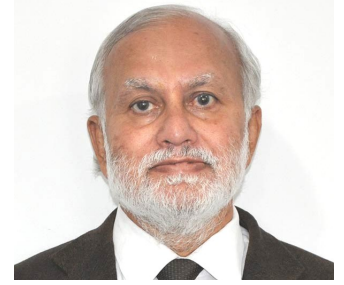
Prof. S. Ayyappan

Mahotsava' during May-August, 2021.

More stakeholders are joining the efforts of KSTA in formulating strategies and disseminating messages on science for society. The Website brings new features on a continuous basis, including the next announcement for the KSTA Awards. We look forward to your suggestions and association with the Academy.

S. Ayyappan

June 30, 2021

Subscription Begins for Bimonthly Magazine '*Vijnana Loka*'

Vijnana Loka is being published regularly in Kannada since August 2007. About 2000 copies of each issue of the magazine are being printed and sent to pre-university and science degree colleges, science centres, libraries and other organizations across the state. The magazine gained popularity over the years and is in demand for subscription by individuals and institutions. The EC has decided to accept subscription for the magazine with the following subscription fee:

SCAN & PAY

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Interested may fill the prescribed application form available in the website kstacademy.in and send the same along with payment details to our email: vijnanaloka@gmail.com

Prof. K. Balaveera Reddy

"National Education Policy will set the foundation for 21st century India. We've given extra impetus to this national policy for ensuring that it makes Indians more empowered and easily attractive to opportunities. We're moving to an era where an individual will not be stuck to a single profession all his life. Thus, he will continuously need to re-skill and up-skill himself. We have kept this in contention while formulating the National Education Policy"

- Shri Narendra Modi
Prime Minister of India

"NationalEducation Policy - 2020 has been directed towards major reforms at school and higher education level. It will create a fantasy -centric education system that directly contributes to the conversionof India into a globalsuperpower"

- Dr. Ramesh Pokhriyal Nishank
Minister for Education

National Education Policy – 2020

Education should be imparted with a view to the type of society that we wish to build. We are working for a modern democracy built on the values of human dignity and equality.

- Dr. Sarvepalli Radhakrishnan

The world is undergoing rapid change. The education system is evolving rapidly in response to social, economic and technological innovations and various scientific and technological advances such as big data, machine learning and artificial intelligence are expecting a workforce with multidisciplinary capabilities including science, social science and humanities. In addition, it is also essential to have universally applicable, thinking, learning, working and other 21st century skills. It is aimed to make India, which has the world's largest educational network and the world's fifth largest economy, a global knowledge superpower. Towards this the Government of India has recently brought out new 'National Education Policy-2020' (NEP-2020). This article describes the views of NEP and its impact on India's education sector.

The Indian higher education system ranks third globally, with US and China occupying the top two positions. At present, there are 982 universities (UGC, 2021) including central, state, private and deemed universities and more than 53,000 colleges in India with more than 3.8 crore students enrolled in them. The current total enrollment ratio in India is 26.5% . The objective of the National Education Policy (NEP) -2020 is to increase this to 50% by 2035 and improve the quality of education and become global education centre.

As Prime Minister Narendra Modi says, National Education Policy will set the foundation for 21st century India. This policy ensures Indians more empowered and easily attractive to opportunities. We are moving to an era where an individual will not be stuck to a single profession all his life. Thus, he will continuously need to re-skill and up-skill himself. National Education Policy is formulated keeping this in mind.

Vision of National Education Policy

This National Education Policy envisions an education system rooted in Indian ethos that contributes directly to transforming India sustainably into an equitable and vibrant knowledge society, by providing high-quality education to all, and thereby making India a global knowledge superpower.

The Policy envisages that the curriculum and pedagogy of our institutions must develop among the students a deep sense of respect towards the fundamental duties and constitutional values, bonding with one's country, and a conscious awareness of one's roles and responsibilities in a changing world.

The vision of the Policy is to instill among the learners a deep-rooted pride in being Indian, not only in thought, but also in spirit, intellect, and deeds, as well as to develop knowledge, skills, values, and dispositions that support responsible commitment to human rights, sustainable development and living, and global well-being, thereby reflecting a truly global citizen.

The Fundamental Principles of the NEP

The fundamental principles that will guide both the education system and individual institutions are:

- Multidisciplinary and a holistic education- in order to ensure the unity and integrity of all knowledge and encouragement for multidisciplinary learning
- Synergy - bringing synergy in curriculum at all levels of education across the country
- Flexibility - learners can choose their own paths in life according to their talents and interests
- Ethics and human and constitutional values - bringing righteousness and human and constitutional values among students
- Creativity and critical thinking to encourage logical decision making and innovation
- Life skills - communication, cooperation, teamwork, and resilience, etc.
- Focus on regular formative assessment for learning
- Encouragement for outstanding research
- Extensive use of technology in teaching, learning and evaluation
- A 'light but tight' regulatory framework to ensure integrity, transparency, and resource efficiency through autonomy, good governance and empowerment
- Emphasis on conceptual understanding instead of monotonous education and test-based education
- Promoting multilingualism and the power of language in teaching and learning
- Respect for diversity and respect for the local context in all curriculum, pedagogy, and policy,
- Full equity and inclusion education
- Teachers and faculty as the heart of the learning process
- A rootedness and pride in India, and its rich, diverse, ancient and modern culture and knowledge systems and traditions
- Education is a public service. access to quality education must be considered a basic right of every child
- Substantial investment in a strong, vibrant public education system
- Key Changes to the Current System

Major Changes in the Present System

In this policy, the following major changes have been made to the present system to provide high quality higher education and re-energize the education system:

- Moving towards a higher educational system consisting of large, multidisciplinary universities and colleges
- Moving towards a more multidisciplinary undergraduate education
- Moving towards faculty and institutional autonomy
- Revamping curriculum, pedagogy, assessment and student support for enhanced student experiences
- Reaffirming the integrity of faculty and institutional leadership
- Establishment of a National Research Foundation
- Governance of higher education institutions by high qualified independent boards having academic and administrative autonomy
- "Light but Tight" regulation by a single regulator for higher education
- Increased access, equity, and inclusion

Holistic and Multidisciplinary Education

National Education Policy is a comprehensive document. Its main objective is to improve the education system by making it inclusive, integrated, multidisciplinary and more productive. India has a long tradition of holistic and multidisciplinary learning, from universities such as Takshashila and Nalanda, to the extensive literatures of India combining subjects across fields. Holistic and Multidisciplinary Education will help develop well-rounded individuals that possess critical 21st century capacities. Multiple entry and exit points, thus, removing currently prevalent rigid boundaries and creating new possibilities for life-long learning. Increased faculty and institutional autonomy in setting curricula. The structure and duration of degree programmes are matched with multiple entry and exit options. India's education system needs such comprehensive and multidisciplinary education to take the country towards the 21st century and fourth industrial revolution.

Institutional Restructuring

It is aimed to increase the Gross Enrolment Ratio in higher education including vocational education from 26.3% (2018) to 50% by 2035.

National Education Policy – 2020 continued . . . . .

Each of multidisciplinary universities, colleges, and HEI clusters/Knowledge Hubs, will aim to have 3,000 or more students. The present complex nomenclature of HEIs in the country such as 'deemed to be university', 'affiliating university', 'affiliating technical university', 'unitary university' shall be replaced simply by 'university'. Gradually, over a period of fifteen years, through a system of graded autonomy', the system of affiliated colleges' will be phased out. A mechanism for granting graded autonomy to colleges through a transparent system of graded accreditation will be established.

Three category of Institutions

The main thrust of this policy regarding higher education is to end the fragmentation of higher education by transforming higher education institutions into large multidisciplinary universities, colleges, and HEI clusters/Knowledge Hubs. Three category of institutions are:

- Research-intensive Universities: Equal emphasis on high quality teaching and high quality research
- Teaching-intensive Universities: Greater emphasis on teaching but still conduct significant quality research
- Autonomous Degree-grating Colleges: Multidisciplinary colleges that grants undergraduate degree and is primarily focused in undergraduate teaching
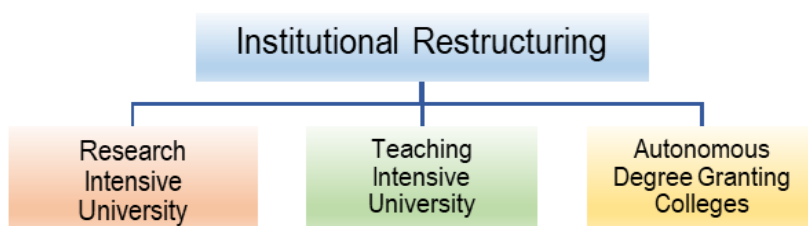
Higher education institutions will have the autonomy and freedom to move gradually from one category to another based on the plans, action and effectiveness Model public universities for holistic and multidisciplinary education, at par with IITs, IIMs, etc., called MERUs (Multidisciplinary Education and Research Universities) will be set up and will aim to attain the highest global standards in quality education. They will also help set the highest standards for multidisciplinary education across India.
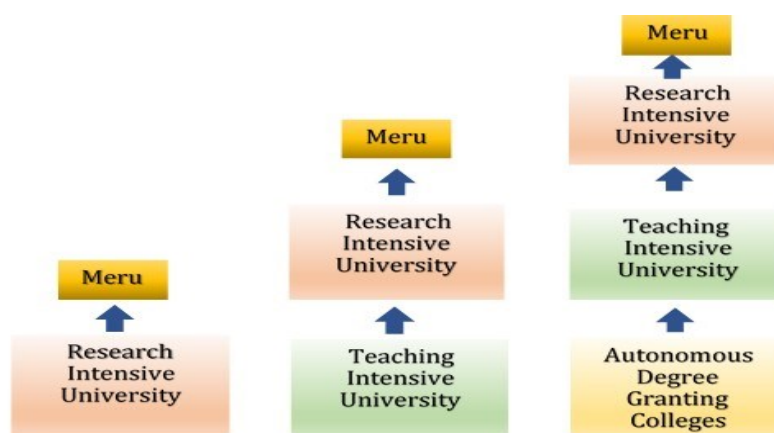

MERU: Multidisplinary Education And Research University

## Transforming the Regulatory System of Higher Education

The regulation, accreditation, funding and academic standard setting of higher education will be performed by distinct, independent, and empowered bodies. These four independent structures will be set up under the Higher Education Commission of India (HECI).

The professional councils, such as the Indian Council for Agricultural Research (ICAR), Veterinary Council of India (VCI), National Council for Teacher Education (NCTE), Council of
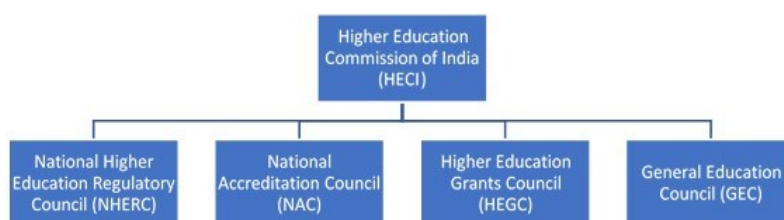
National Higher Education Regulatory Council (NHERC): common, single point regulator for the higher education sector
National Accreditation Council (NAC): a robust system of graded accreditation
Higher Education Grants Council (HEGC): funding and financing of higher education based on transparent criteria
General Education Council (GEC): frames expected learning outcomes – characteristics of degree

Architecture (CoA), National Council for Vocational Education and Training (NCVET) etc., will act as Professional Standard Setting Bodies (PSSBs) and do not have any regulatory role. They will play a key role in the higher education system and will be invited to be members of the GEC
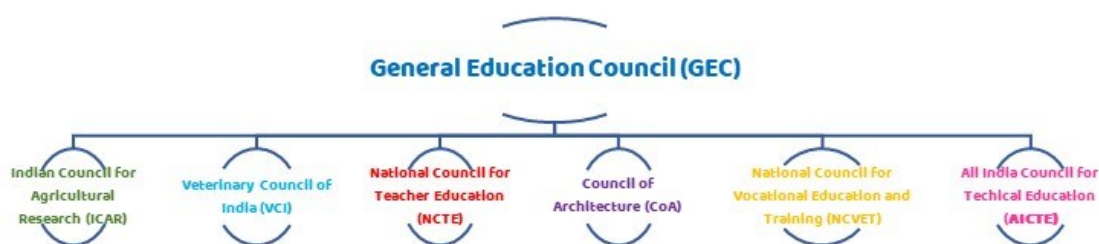
Effective Governance and Leadership

Through a suitable system of graded accreditation and graded autonomy, and in a phased manner over a period of 15 years, all HEIs in India will aim to become independent self-governing institutions. Upon receiving the appropriate graded accreditations, a Board of Governors (BoG) shall be established

Establishment of National Research Foundation

The overarching goal of the NRF will be to enable a culture of research in HEIs, research laboratories and other research institutions. The NRF will be governed, independently of the government, by a rotating Board of Governors consisting of the very best researchers and innovators across fields. The primary activities of the NRF will be to:

- Fund competitive, peer-reviewed grant proposals of all types and across all disciplines;
- Seed, grow, and facilitate research at academic institutions where research capabilities are currently limited
- Act as a liaison between researchers and relevant branches of government as well as industry
- Department of Science and Technology (DST), Department of Atomic Energy (DAE), Department of Bio-Technology (DBT), Indian Council of Agriculture Research (ICAR), Indian Council of Medical Research (ICMR), Indian Council of Historical Research (ICHR), and University Grants Commission (UGC), as well as various private and philanthropic organizations, will continue to independently fund research according to their priorities and needs.
- Recognise outstanding research and progress

Internationalization

Having a larger numbers of international students studying in India and provide greater mobility to students in India who may wish to visit, study at, transfer credits to, or carry out research at institutions abroad, and vice versa. Promote India as a global study destination providing premium education at affordable costs. Facilitate research/teaching collaborations and faculty/student exchanges with high-quality foreign institutions. High performing Indian universities will be encouraged to set up campuses in other countries and similarly, selected universities e.g., those from among the top 100 universities in the world will be facilitated to operate in India and a legislative framework facilitating such entry.

Structure and duration of degrees

A. **Non-professional degrees**: undergraduate degree will be of either 3 or 4-year duration, with multiple exit options. within this period, with appropriate certifications. The 4-year programme may also lead to a degree 'with Research' if the student completes a rigorous research project in their major area(s) of study as specified by the HEI

B. Non-professional Master's programmes:

HEIs will have the flexibility to offer different designs of Master's programmes: There may be a 2-year programme with the second year devoted entirely to research for those who have completed the 3-year Bachelor 's programme; (b) for students completing a 4-year Bachelor 's programme with Research, there could be a 1-year Master's programme; and (c) there may be an integrated 5-year Bachelor's/Master's programme. Undertaking a Ph.D. shall require either a Master's degree or a 4-year Bachelor's degree with Research. The M.Phil. programme shall be discontinued.

Non-professional Course

Course	Existing	NEP 2020	
(UG/PG)	Duration (Years)	Duration (Years) 3 Years UG	Duration (Years) 4 Years UG
BA/MA	3/2	3/2	4/1
BSc./MSc.	3/2	3/2	4/1
BCom./MCom.	3/2	3/2	4/1
BBA/MBA	3/2	3/2	4/1
BSW/MSW	3/2	3/2	4/1
LLB/LLM	3/2	3/2	4/1

Professional Education

Preparation of professionals must involve an education in the ethic and importance of public purpose, an education in the discipline, and an education for practice. Professional education is an integral part of the overall higher education system. Stand-alone agricultural universities, legal universities, health science universities, technical universities and stand-alone institutions in the other fields, shall to become multidisciplinary institutions offering holistic and multidisciplinary education. India must also take the lead in preparing professionals in cutting-edge areas that are fast gaining prominence, such as Artificial Intelligence (AI), 3-D machining, big data analysis, and machine learning, in addition to genomic studies, biotechnology, nanotechnology, neuroscience, with important applications to health, environment, and sustainable living that will be woven into undergraduate education for enhancing the employability of the youth.

Structure and Duration of Technical Education Degrees

The current professional bachelor and master degree programs are 4 and 2 years respectively. which can be redesigned as a 3-year bachelor degree and a 2-year master degree. Some examples of professional degree courses

Professional Degrees: The degree will be of either 3 or 4-year duration, with multiple exit options with appropriate certifications. Students of 5 years multidisciplinary program will get the degree with advanced internship and research. Students of the 5-year multidisciplinary Bachelor's programme with internship and research will get degree. Similarly, the duration of Bachelor and Master degree may be redesigned as below:

Course	Existing	NEP 2020	
(UG/PG)	Duration (Years)	Duration (Years)	Duration (Years)
BTech./MTech.	4/2	4/2	5/1 or 4/1*
BSc.(Agri)/ MSc(Agri)	4/2	4/2	5/1 or 4/1*
BVSc./MVSc.	4/2	4/2	5/1 or 4/1*
BHM/MHM	4/2	4/2	5/1 or 4/1*
BFA/MFA	4/2	4/2	5/1 or 4/1*
BVA/MVA	4/2	4/2	5/1 or 4/1*

* 1st year PG program can be completed in 3rd and 4th year UG programs. Thus, saving 1 year of PG period.

a. 5 and 2 years (Such as BArch and MArch)

b. 5 and 3 years (Such as BDS and MDS)

c. 5 ½ and 3 years (sucha s MBBS and MD or MS)

Technology in Education

Education is playing a crucial role in India's global reach in information and communication technology including other cutting-edge fields such as space and also in success of digital India campaign. Similarly, technology is playing an important role in the improvement of educational

processes and outcomes; thus, the relationship between technology and education at all levels is bi-directional.

An autonomous body, the National Educational Technology Forum (NETF), is being created to provide a platform for the free exchange of ideas on the use of technology to enhance teaching-learning, assessment, planning and administration. Technology will be implemented at all levels of the education system to improve classroom processes, support teachers' professional development, streamline academic planning, administration and management. Technology based educational platforms, such as DIKSHA/SWAYAM will be integrated across higher education. Active role in conducting research on Disruptive Technologies and create institutional materials and courses including online courses in cutting edge domains

Online Education and Digital Education

New circumstances and realities require new initiatives. The recent Covid19 pandemic made us to realise this. We have to ready with alternative modes of quality education whenever and wherever traditional and in-person modes of education are not possible.

A dedicated unit for the purpose of orchestrating the building of digital infrastructure, digital content and capacity building will be created in the Ministry of Education (MoE) to look after the e-education needs of both school and higher education.

Teachers and National Education Policy 2020

Teachers truly shape the future of our children - and, therefore, the future of our nation. It is because of this noblest role that the teacher in India was the most respected member of society. Society gave teachers, or gurus, what they needed to pass on their knowledge, skills, and ethics optimally to students. The motivation and empowerment of teachers is required to ensure the best possible future for our children and our nation.

Role of Teachers in New Policy

The role of teacher in shaping the minds of the younger generation is very important. Hence, teachers must be passionate, motivated, and well qualified, and well trained in content, pedagogy, and practice. Apart from this a teacher has to play many roles in new paradigm.

- To understand the significance of education in general and higher education in particular, in Indian and global context
- To anchor designing, developing, creating & managing content, implementing and evaluation of all training & development programs.
- To keep abreast with latest developments in their specific and to develop human resources with latest developments in their specific field of specialization. To sharpen and improve the art of modern teaching-learning methodologies.
- To instill ethical & moral values and promote lifelong learning opportunities for all its human resources.
- To promote the use of ICT, multimedia technologies including Interactive multimedia, 3D animation, Virtual realities techniques in teaching-learning process. To promote use of in teaching-learning process (Delivery style, Content, Presentation, Etiquette, Attitude, Board work, Class management etc.).
- To expand & promote programs for other Universities, States, Governments and Corporates. To develop Networking of institutions engaged in similar activity and to play supportive and collaborative role to enhance quality of higher education.
- To acquire & improve the art of teaching to achieve the goals of higher education. To develop model curriculum & syllabi for each course.
- To understand the organization & management of a College/ University, perceive the role of teachers in the total system and to participate accordingly.
- To establish strategic alliance with several learning places (between colleges, different centers of excellence, business, industry, services, government etc.,). Organizing pre-deployment training and in-service training for teachers and staff

- Organizing orientation, refresher, short-term courses, workshops, seminars and other communication programs for university faculty in higher education. To establish centers for training, research, training evaluation and such other activities as may be necessary.
- To undertake, aid, promote and coordinate research and training on its own or through other agencies.
- To continually undertake skill /competency mapping of existing academic and non-academic staff associated with higher education. •To provide adequate opportunities for up skilling and re-skilling of academic and non-academic staff so that they are competitive to meet up the highly dynamic nature of global higher education systems.
- To develop world class learning resources center to cater to the informational needs of the academic staff.
- To nurture creativity, IPR and Patent culture
- HEls shall move to a criterion -based grading system that assesses student achievement based on the learning goals for each programme.
- Assessment from high stakes examinations towards more continuous and comprehensive evaluation.
- Set up high quality support centres to encourage and support students from socio-economically disadvantaged background.
- Set up professional academic and career counselling to ensure physical, psychological and emotional well being.
- Multidisciplinary institution of higher learning - UG and PG programmes with high quality teaching, research and community engagement. Open and distance learning programmes.
- Value based education.
- Internationalization of education - through institutional collaborations.
- Technology based education platforms, such as DIKSHA/SWAYAM - integrated across higher education.
- Active role in conducting research on disruptive technologies.
- Online courses in cutting edge domains and Research - linkages with higher learning institutions.
- Establishment of Academic Bank of Credit (ABC) - digitally store the academic credits earned by various recognized HEls

Conclusion

Today we are in the era of Globalization. Globalization, a double edged sword, boon or a bane. Effect of this on India is mixed, more tilted towards negative. Manufacturing base is diminishing. Job scenario is changing significantly. Number of jobs available has shrunk greatly due to recession. However, the direction to Higher Education System will change during the next few decades. A comprehensive and multidisciplinary education system will be established with a "Great Convergence" in all disciplines of Higher education in next few years. There will be radical changes in higher education by emphasizing on skill-based education. Skilled knowledge with innovation efficient human resources, instant decision-making active leadership, knowledge-based industries, skill development programs, techno-entrepreneurship and 21st century skills can overcome a lot of the problems we are facing today.

Skill Development: Some important skill development programs are

- Analysis and Design Skills
- Application skills
- Knowledge Engineering Skills
- Organizational Skills
- Interpersonal Skills
- Communication capacity
- Entrepreneurship Skills
- Other Special Skills

21st Century Skills: The following list provides brief on knowledge skills, career and character commonly associated with 21st century skills.

- Critical thinking, problem solving, reasoning, analysis, explanation, information interpretation skill.
- Research skills, practicality and questioning
- Creativity, artistry, curiosity, imagination, innovation, personal expression
- Perseverance, self-direction, planning, self-discipline, adaptability, initiative, verbal and written communication, public speech and presentation, logical action
- Leadership, team work, collaboration, cooperation, ability to use virtual system
- Information and Communication Technology (ITC) Literacy, Media and Internet Literacy, Data Analysis, Computer Programming
- Awareness of civic value, moral and social justice
- Entrepreneurship, Economic and Financial Literacy
- Global awareness, multicultural literacy, humanity
- Scientific literacy and reasoning, adoption of scientific method
- Environment and Conservation Literacy, Ecosystem Understanding
- Health and Wellness Literacy - Nutrition, Diet, Exercise and Public Health & Safety

Techno-entrepreneurship

Techno entrepreneurship is a newest developing trend. Technology entrepreneurship is a vehicle that facilitates prosperity in individuals, firms, regions, and nations. Cultivating the seeds of young entrepreneurs always ends up with harvesting employment opportunities and economic development of community. It has upstream and downstream multiplier effect outnumber the direct employment. Its development requires the adoption of national and state industrial policies in addition to appropriate training methods and development of skilled knowledge force and good techno entrepreneurs.

The 21st century belongs to India and our country will play the role of Vishwaguru. We need to have the talent and skill capabilities required for techno entrepreneurship. More than a billion people are our huge resource. Let us make India a developed nation by promoting job creators and leaders at all levels.

Bharat Ratna Sir Mokshagundam Visvesvaraya, better known as Sir MV, observed that "well-equipped industries, efficient managers, trained technologists and skilled workers are the true wealth of the nation". His proclaims "Industrialise or Perish"; "Work more and Produce More";" Support Indian Industries"; "Think in Terms of Nation" shows his clear view of empowering India.

"Adopt Technology or Lose Importance" is very relevant for today's society. Hence, "Techno-entrepreneurs are the creators of wealth and employment".

Our ancient India had the world famous universities like Nalanda, Taxila, Vikramashila, Vallabhi, etc., and attracted the greatest scholars around the world with high standards of multi-disciplinary teaching and research. The ancient education system has given the world great scholars like Charaka, Sushruta, Aryabhata, Varahmihira, Bhaskaracharya, Patanjali, Nagarjuna, etc., who has made their most valuable contributions in various fields such as mathematics, astronomy, metallurgy, medical science and surgery, construction, architecture, shipbuilding and navigation, yoga, fine arts, chess, etc. Indian culture and philosophy have had a strong impact on the world. Under the external invaders, our ancient time-tested education system was destroyed and westernised. After independence, successive Governments tried to introduce new education policies to bring back the glory of our country. Recently, the Government of India has introduced the ambitious National Education Policy-2020, which has widened the scope of providing autonomy to institutions to bring in high standards. My Dear Professor/Friends, here we have wonderful/great opportunity to contribute to the successful implementation of the National Education Policy-2020 and be part of the process of bringing back glory. Come and let's all join hands.
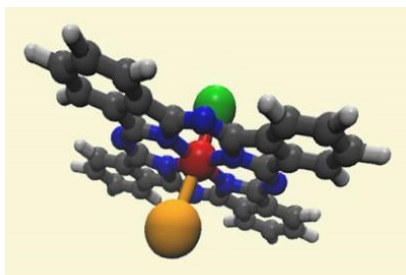
Prof. K. Balaveera Reddy

Member, Karnataka Science and Technology Academy

Former Chancellor, Visvesvaraya Technical University, Belgaum

Current Science and Technology

'Drone' – ready for atomic control !

Now, Drone is everywhere . These Unmanned Aerial Vehicles, originally developed for the military and aerospace usage, available in a variety of sizes and types, have demonstrated their effectiveness in delivery, defence, space, healthcare, photography, agriculture and many other civilian uses. They are very precise in performing the assigned task and now are also capable of nuclear control. Surprised? Yes, In their demo, Prof. Massimiliano Cavallini and his research team at Italian National Research Council, have showed that in a simple electrochemical cell at ambient conditions, how, lowering of the potential caused the 'drones' deposited across the surface to pick up atoms and leave vacancies.

Further, once a vacancy has been formed, a substitute atom can be dropped in its place by mean of underpotential deposition. It may even be possible eventually to adapt the drones to add atoms onto surfaces without creating a vacancy first, says Prof. Cavallini. The direct manipulation of individual atoms has led to the advancement of exciting cutting-edge technologies in sub-nanometric fabrication, information storage and to the exploration of quantum technologies.

Atom manipulation is currently performed by scanning probe microscopy (SPM), which enables an extraordinary spatial control, but provides a low throughput, requiring complex critical experimental conditions and advanced instrumentation which are available in a limited number of laboratories. Using such a complex instrumentation one can only manipulate atoms one by one. Most of the atom-scale devices developed were manufactured in an ultra-high vacuum and under cryogenic conditions. That means the patterns produced tend to be unstable under ambient conditions.

In a new model, the limitations of SPM techniques overcome by replacing the SPM probe with a coordination compound that exploits surface atom complexation as a tool for atomic-scale fabrication. This coordination compound is the "molecular drone". It lands onto a substrate, bonds to a specific atom on the surface, picks it up, and then leaves the surface and thus creating an atomic vacancy on the surface. Remarkably, the feasibility of the process is demonstrated under electrochemical control and the stability of the fabricated pattern at room temperature, under ambient conditions.

Iron(III) phthalocyanine chloride, a compound which can form coordination bonds using its metal. 'Iron(III) has a strong capability to form octahedral complexes. The team say, this research may open the door to rapid atomic manipulation and fabrication on a relatively large scale.
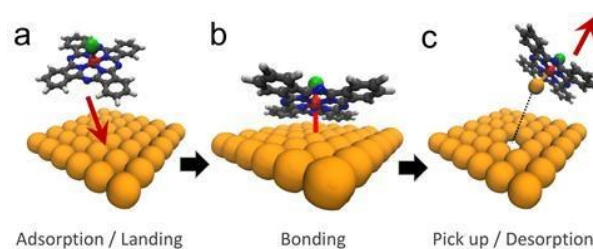
Coordination between the iron(III) of the 'molecular drone' and the surface allows the removal of individual atoms
Source: © 2021 Wiley-VCH GmbH
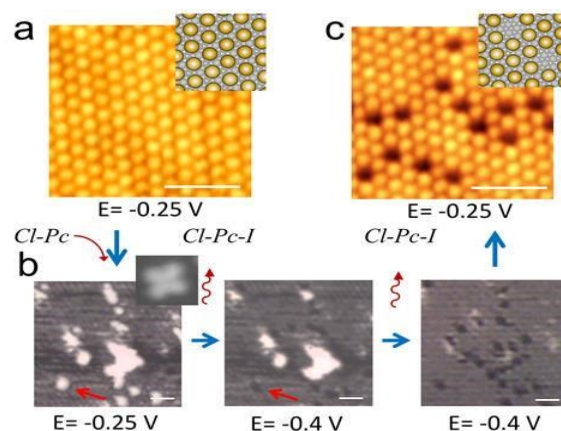
Scanning tunnelling microscopy image of the vacancies left by the phthalocyanine 'molecular drone'
Source: © 2021 Wiley-VCH GmbH

Further Research Opportunities: Though this is a great achievement, the vacancies created by this method are found in group without following any particular pattern and quantitative description of spatial distribution of vacancies is not currently achieved in this research. There is an enormous library of phthalocyanine derivatives and growth modes available and which could be used to direct the drone to control the pattern as done in SPM.

- **Dr. Anand R**
Senior Scientific Officer, KSTA

Programs carried out during First Quarter (April - June 2021) of FY 2021—'22

During the period of April - June 2021, following twenty three 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	Program Title	Associate Institution/ Organisation	Beneficiaries (No.)
1	27 April 2021	Monthly Science Lecture Series - 09 - PATH OF SCIENCE by Dr. Palahalli Vishwanath	ICAR, NaaViC and NIVEDI	34
2	30 April 2021	Basics of IPR by Shri Vivekananda Sagar	ICAR, NaaViC and NIVEDI	244
3	07 May 2021	IP Filing in India by Dr. Sarasija Padmnabhan	ICAR, NaaViC and NIVEDI	240
4	13 May 2021	Searching in Databases of Patents by Dr. Sarasija Padmnabhan	-	289
5	06 May 2021	"COVID-19 and mental health: the hidden pandemic" by Dr. Muralidhar Keshavan	-	87
6	12 may 2021	Bharata Swantantra Amruta Mahotsava (BSAM) Lecture Series: Beliefs and Mental Health by Dr. C R Chandrashekar	-	87
7	19 May 2021	Bharata Swantantra Amruta Mahotsava (BSAM) Lecture Series: Pitfalls and Prospects in Science Communication by Shri Nagesh Hegde	-	64
8	20 May 2021	"COVID-19: Lesson for Science and Society"	-	58
9	21 may 2021	Empowering Youth in Agripreneurship	-	1054
10	25 May 2021	"Indigenous Anti-diabetic Plants in North Karnataka in the perspective of COVID-19"	ICAR, NaaViC and NIVEDI	59
11	28 May 2021	"Dairy Processing and Value Addition:Entrepreneurial Opportunities and Strategies"	Gravity Science Foundation	866
12	31 May 2021	Monthly Science Lecture Series -10 "COVID-19 From First Wave to Second Wave and Beyond" by Dr. N Prabhudeva	-	44
13	02 June 2021	Bharat Swatantra Amruta Mahotsava Science Lecture Series – 03 Genetic Nutrient Biofortification of Food Crops by Prof. C Kameshwar Rao	-	115
14	05 June 2021	Environmental Day Celebration Sessions "Ecological restoration of mangroves: A potential implication for climate change mitigation" by Dr. Raman Kumar Trivedi and "The Science - Law Interface: A Futuristic Pointer for Environmental Management?" by Dr. R. Nagendran	Pilikula Regional Science Centre, Mangalore and Surana College, Bengaluru	116
15	07 June 2021	Taking Charge of Your Health Reducing Lifestyle Risk Factors by Dr. Pratima Murthy	-	65
16	08 June 2021	Neuromuscular Disorders by Dr. Gayathri N	-	121
17	08 June 2021	Understanding Electroconvulsive Therapy (ECT) by Dr. Chittaranjan Andrade	-	123
18	09 June 2021	Bharat Swatantra Amruta Mahotsava Science Lecture Series – 04 Role of Food, Nutrition, Lifestyle in Enhancing Immunity by Dr. V Prakash	-	305
19	10 June 2021	Orientation and Skill Development for SSLC Students	Gravity Science Foundation	667
20	11 June 2021	Showcasing AI START-UPS Solving Problems of "Farming Systems and Future Opportunities"	ICAR, NaaViC and NIVEDI	923
21	11 June 2021	Vijnana Prasar – Scope Kannada Webinar: 'ಕರ್ನಾಟಕದ ಬಾವಲಿಗಳು'; Shri Rajesh Puttaswamaiah	-	
22	16 June 2021	Bharat Swatantra Amruta Mahotsava Science Lecture Series – Lecture 5: Equity and Inclusion in Science -Dr Godbole Rohini Madhusudan	-	164
23	23 June 2021	Bharat Swatantra Amruta Mahotsava Science Lecture Series – Lecture 6: Patient in an Unknown World– Nadoja Dr P. S. Shankar	-	142

MOU and Collaborations

During the FY 2021-22 MOU with the following two organisations/institutions were signed and in total 28 were MOU signed till date:

Sl.No.	Organisations/institutions	Date of MOU
1	Chirst (Deemed to be University)	09.04.2021
2	YKR Adventure Sports and Eco Tourism, Bengaluru	15.04.2021

Proposed Programs for FY 2021-'22

Science and Technology Annual Conference : On the occasion of International Year of Fruits and Vegetables 2021, a national conference will be held during November 15-16, 2021 in association with Vijnanaprasar, Government of India and University of Horticultural Sciences, Bagalkot.

Science and Technology Conference in Kannada : Fourth Science and Technology Conference in Kannada will be held in November 2021

KSTA Awards :

♦ **Life time Achievement award:** A distinguished scientist of the State who has made an outstanding contribution in the field of science and technology as well as for the development of the Country will be bestowed with KSTA Life Time Achievement Award. The selected scientist will be felicitated with award during annual KSTA Conference.

♦ **Lifetime Achievement Award in Science Communication:** In order to recognize the outstanding contribution in the field of science popularisation and communication in Kannada, Lifetime Achievement Award is being given every year during S&T conference in Kannada.

♦ **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 comprises of cash prize of Rs. 10,000/- along with a certificate.

Nominations are invited for Lifetime Achievement Award 2021. Nominations should be made in prescribed formatted by August 2021. Please visit kstacademy.in for details and nomination format.

Vijnana Loka — Bimonthly Magazine: During FY 2021-'22, six issues will be published and will be sent to pre-university and science degree colleges, science centres, libraries and other organizations across the state.

Science Communication, Interlocution and Science Popularization: Science communication workshops, interfacing science writers and publishers, media communication and programs. for science popularisation in Kannada will be organised.

Innovation Platform and Promote Indigenous Talents in Frontline S&T Areas, with a focus on Entrepreneurship development: The program aims to bring the innovations by the general public in the state, especially the rural population to the mainstream.

Digital Content Generation, Production of Science Capsules, Short Feature Films /Clippings : Development of digital information in frontier areas of science and technology and knowledge base. Production of talk by expert, short films and feature films in KSTA and distribution of the same to educational institutions in the backward areas through DVD/CD.

Other Programs

♦ Celebration of National and International Days of importance related to Science and Technology
♦ Science Model Performance Competition for High School Students
♦ Short Study and Small Grants: to encourage organization of science promotional programs by educational institutions, universities and other associations across the state.
♦ Policy, Strategy, Approach and Status Papers
♦ Membership, Fellowship and Emeritus positions .
♦ Collaborative R&D with Corporate Institutions
♦ Post COVID-19 Restoration related Workshops and Publications
♦ PME & Impact Assessment Studies of KSTA Activities

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.

Contact

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