KERNEL

INDIAN INSTITUTE OF SCIENCE

Kernel is an annual magazine that provides a glimpse of the Indian Institute of Science (IISc) and highlights some recent research and other initiatives

KERNEL

IISc 2020

भारतीय विज्ञान संस्थान

CONTENTS

TS

FROM THE DIRECTOR

Greetings from IISc, as we bring you the 2020 edition of **Kernel.** Published annually, **Kernel** aims to reacquaint you with IISc and provide you with a flavour of the diversity and quality of research carried out at the Institute.

Established in 1909, IISc is India's top ranked university and a premier institution of advanced education and research in the sciences and in engineering. Since its inception, it has laid a balanced emphasis on the pursuit of basic knowledge, as well as on the application of its research findings for industrial and societal benefit. IISc's academic faculty is organised into six divisions: (i) Biological Sciences (ii) Chemical Sciences (iii) Electrical, Electronics, and Computer Sciences (iv) Mechanical Sciences (v) Physical and Mathematical Sciences and (vi) Interdisciplinary Research.

IISc's reputation ensures that it attracts bright and accomplished young faculty members trained in the best laboratories around the world. Our faculty and scientific staff, numbering over 500, carries out research in most areas of the basic and applied sciences, publishing vigorously in premier journals. This year, as in previous years, several of them have won national and international accolades for their research.

With some of the best students in the country seeking entry into IISc, it places emphasis on a strong research training programme and the pursuit of cutting-edge research by all its students. IISc has a student population of around 4200, of which there are about 2700 doctoral students, roughly 1000 Master's students in the engineering disciplines, and about 450 students pursuing BSc (Research), a four-year, research-oriented undergraduate programme in the sciences. Doctoral students are selected carefully based on their performance in national examinations, in addition to personal interviews. All the degree programmes involve exposure to research through course projects and dissertation research. The Institute also emphasises innovation in curriculum; in 2019, new MTech degree programmes in Artificial Intelligence and Smart Manufacturing were introduced.

This issue of **Kernel** highlights some key discoveries and innovations from each of the six divisions. It also spotlights research on water – the stuff of life. The many challenges surrounding this vital resource are being addressed using different approaches by faculty members from various

departments at IISc. The current issue also provides a glimpse of several new initiatives that were launched in 2019 by IISc, now recognised as an Institution of Eminence (IoE) by the Ministry of Human Resource Development, Government of India.

IISc is a publicly funded research university, and we are grateful to the Government of India for their unstinted and continued support of the Institute through direct grants and through competitive research grants. In 2015, IISc set up the Office of Development and Alumni Affairs (ODAA) to actively raise funds from non-government sources. This fledgling office has succeeded in garnering support for major infrastructure projects and several endowments, whose earnings go towards faculty Chairs and student support.

I take this opportunity to acknowledge the unflinching support of the members of the Court and the Governing Council in taking IISc to where it stands today. Their continued guidance will be crucial as we embark on a future filled with challenges and endless possibilities.

Anurag Kumar
Director

THE INSTITUTE

The Indian Institute of Science (IISc) is an institution of higher learning and research established in 1909 under the Charitable Endowments Act, 1890. With the establishment of the University Grants Commission in 1956, the Institute came under its purview as a Deemed University. The principal authority governing the Institute is the Council, which is advised by the Court in the formulation of policies. The Director is the Chief Executive of the Institute and is assisted in its management by the Senate and the Faculties of Science and Engineering.

VISITOR
The President of India

PRESIDENT OF COURT
N Chandrasekaran

CHAIR OF GOVERNING COUNCIL
P Rama Rao

DIRECTOR
Anurag Kumar

DEANS

AG Samuelson (Science Faculty)
YN Srikant (Engineering Faculty)
PS Anil Kumar (Undergraduate Programme)
Nagasuma Chandra (Associate Dean, Undergraduate Programme)

DEPUTY DIRECTORS

Rudra Pratap (Planning and Infrastructure)
Jayant Modak (Administration and Finance)

DIVISIONAL CHAIRS

Umesh Varshney (Biological Sciences)
PK Das (Chemical Sciences)
Y Narahari (Electrical, Electronics, and Computer Sciences)
G Rangarajan (Interdisciplinary Research)
Vikram Jayaram (Mechanical Sciences)
Rahul Pandit (Physical and Mathematical Sciences)

REGISTRAR

V Rajarajan

THE GOVERNING COUNCIL

P Rama Rao
Chair of Governing Council
Former Vice-Chancellor
Univ of Hyderabad (IISc Court Representative)

Amit Khare
Secretary, Min of Human Resource Development,
Govt of India (GoI Nominee)

Chandra Shekhar Kumar
Joint Secretary
Department of Higher Education
MHRD

AS Kiran Kumar
Former Secretary, Dept of Space,
Govt of India (GoI Nominee)

Rajkumar Khatri
Additional Chief Secretary, Higher Education Dept,
Govt of Karnataka (GoK Nominee)

ISN Prasad
Additional Chief Secretary,
Finance Dept,
Govt of Karnataka (GoK Nominee)

JJ Irani
Director
Tata Sons Ltd (Tata Trusts Nominee)

Ranendra Sen
Former Diplomat
(Tata Trusts Nominee)

Rajendra Prasad
Director, Amity Institute of Biotechnology
Amity Univ (UGC Representative)

Suresh C Angadi
Member of Parliament
Lok Sabha (Parliament Representative)

Narendra Jadhav
Member of Parliament
Rajya Sabha (Parliament Representative)

RS Bawa
Vice Chancellor
Chandigarh University
(Indian Universities Representative)

Sandeep Sancheti
Vice Chancellor
SRM Institute of Science & Technology (Indian Universities Representative)

Anil D Sahasrabudhe
Chairman
AICTE (AICTE Representative)

Shekhar C Mande
Director General
CSIR (CSIR Representative)

Anurag Kumar
Director (Ex-officio)

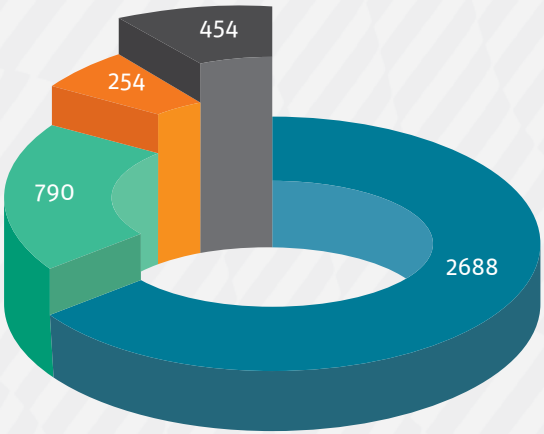
AG Samuelson
Dean, Science Faculty (Ex-officio)

YN Srikant
Dean, Engineering Faculty (Ex-officio)

V Rajarajan
Registrar (Ex-officio), Secretary

The Council is the principal authority of the Institute and its members include nominees of the Government of India, Government of Karnataka, Tata Trusts, University Grants Commission, Parliament of India, Court of IISc, Association of Indian Universities, All India Council for Technical Education, and Council of Scientific & Industrial Research, besides ex-officio members from IISc

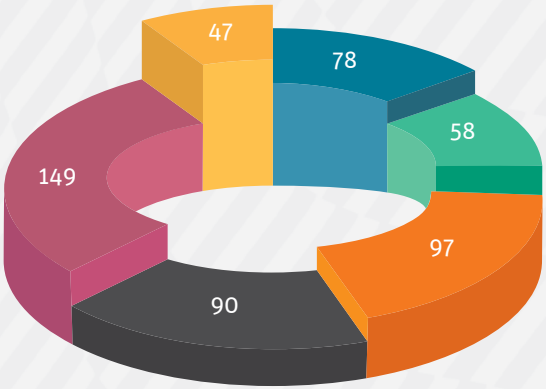
IISc IN NUMBERS (2019)



Students on Roll

- PhD/Int PhD
- Other Master's programmes
- MSc (Engg)/MTech (Research)
- Bachelor of Science

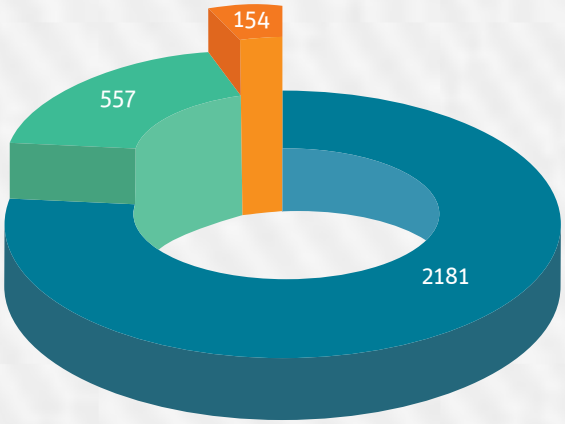
Total: 4186



Faculty and Scientific Staff

- Biological Sciences
- Chemical Sciences
- Electrical, Electronics and Computer Sciences
- Physical and Mathematical Sciences
- Mechanical Sciences
- Interdisciplinary Research

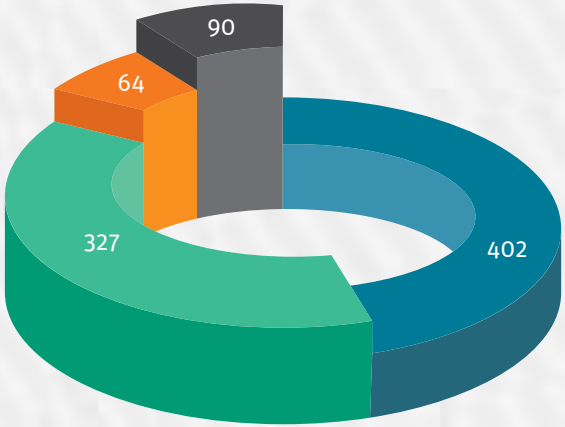
Total: 519



Publications

- Journal Articles
- Conference Papers
- Books, book chapters and others

Total: 2892



Degrees Awarded (Convocation)

- PhD/Int PhD
- Other Master's programmes
- MSc (Engg)/MTech (Research)
- Bachelor of Science (Research)

Total: 883

NOTABLE AWARDS

ROHINI GODBOLE

HONORARY PROFESSOR, CENTRE FOR HIGH ENERGY PHYSICS

Padma Shri

Contributions to methods of searching for new particles and interactions in high energy particle colliders, as well as the designs of these colliders

G MUGESH

PROFESSOR, DEPARTMENT OF INORGANIC AND PHYSICAL CHEMISTRY

Infosys Prize

Contributions to chemical synthesis of small molecules and nanomaterials for biomedical applications

ANINDA SINHA

ASSOCIATE PROFESSOR, CENTRE FOR HIGH ENERGY PHYSICS

Shanti Swarup Bhatnagar Prize

Contributions to quantum field theory and string theory, in particular conformal bootstrap and entanglement entropy

NATIONAL RANKINGS


Government of India
Ministry of Human Resource Development
nirf
Certificate
NATIONAL INSTITUTIONAL RANKING FRAMEWORK
INDIA RANKINGS 2019
Indian Institute of Science, Bengaluru
Ranked 2 in Overall Category
CHAIRMAN, NBA
MEMBER SECRETARY, NBA


MIC
Government of India
Ministry of Human Resource Development
ARIIA
ATAL RANKING OF INSTITUTIONS ON INNOVATION ACHIEVEMENTS
RANKING 2019
Indian Institute of Science, Bengaluru
ranked Fourth under the category of Government funded institutions.
Dr. Anil D. Sahasrabudhe
Chairman, AICTE
Shri R. Subrahmanyam
Secretary (Higher Education), MHRD
Dr. Abhay Jere
Chief Innovation Officer, MIC, MHRD

DIVISIONS

The Institute comprises six Academic Divisions:

Biological Sciences

Chemical Sciences

Electrical, Electronics, and Computer Sciences

Interdisciplinary Research

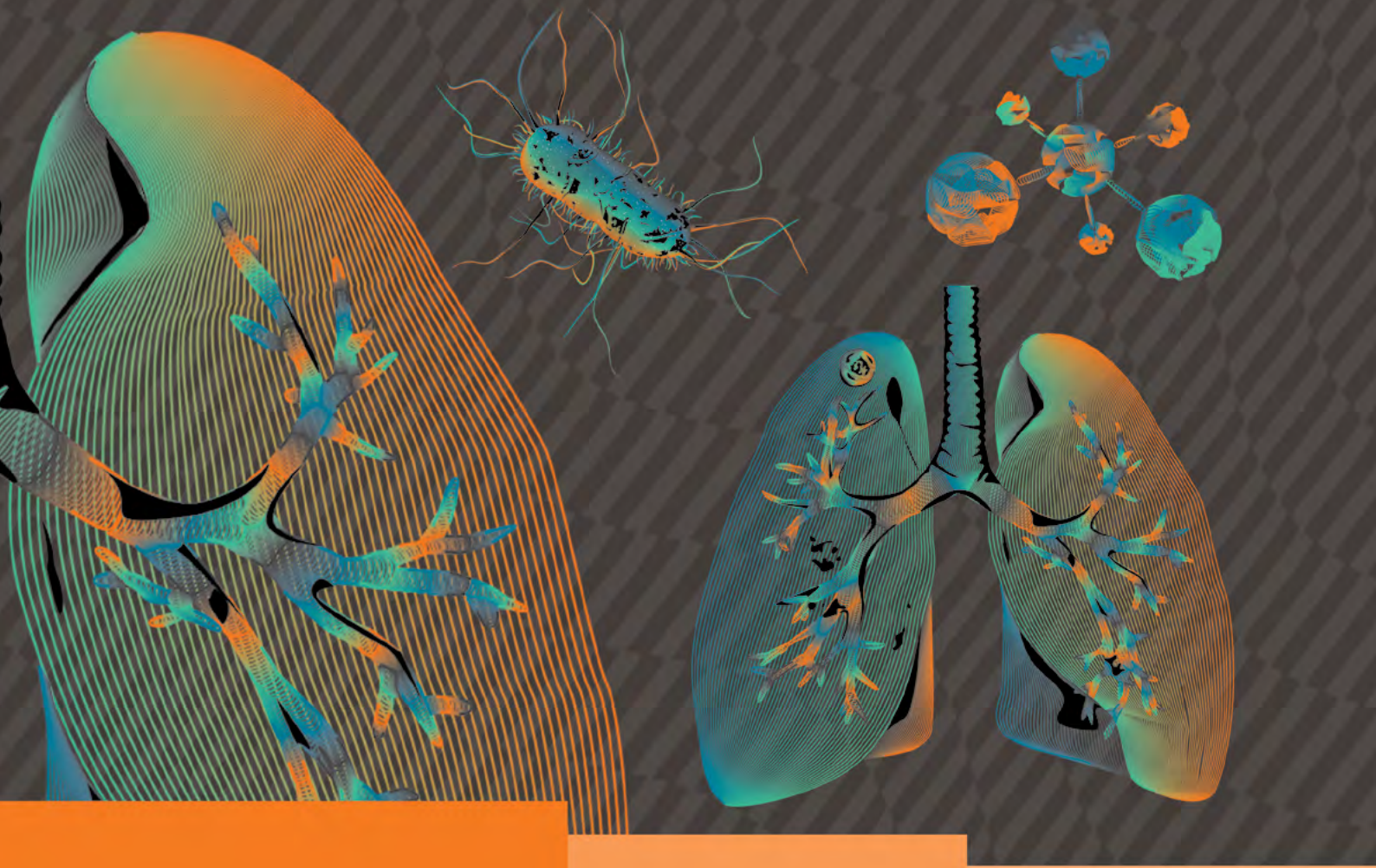
Mechanical Sciences

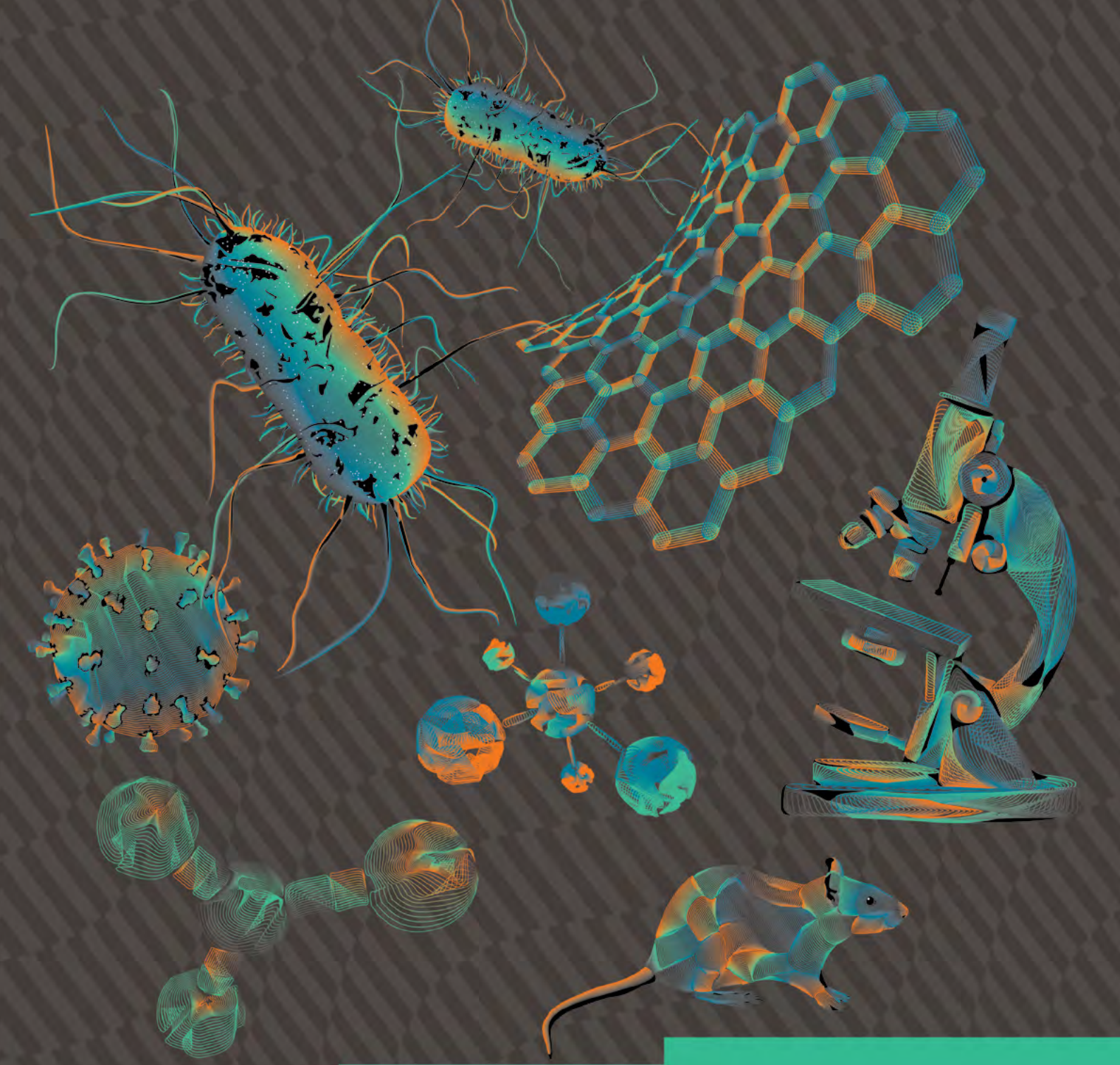
Physical and Mathematical Sciences

DIVISION OF

BIOLOGICAL SCIENCES

DEPARTMENT OF BIOCHEMISTRY
CENTRAL ANIMAL FACILITY
CENTRE FOR ECOLOGICAL SCIENCES
CENTRE FOR INFECTIOUS DISEASE RESEARCH
CENTRE FOR NEUROSCIENCE
DEPARTMENT OF MICROBIOLOGY AND CELL BIOLOGY
MOLECULAR BIOPHYSICS UNIT
DEPARTMENT OF MOLECULAR REPRODUCTION, DEVELOPMENT AND GENETICS



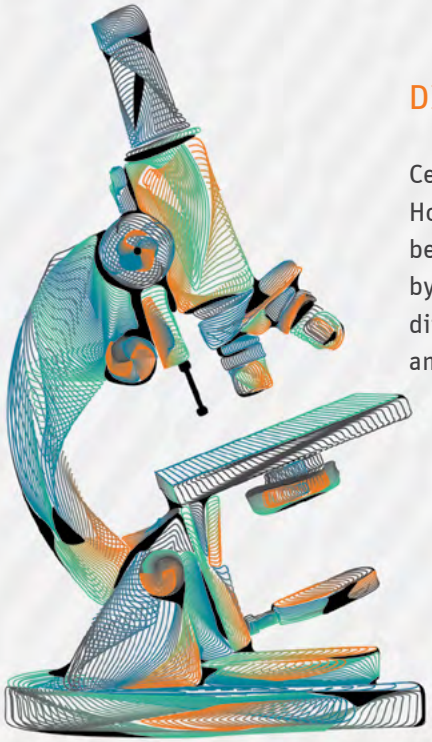


BIOLOGICAL SCIENCES

RESEARCH HIGHLIGHTS

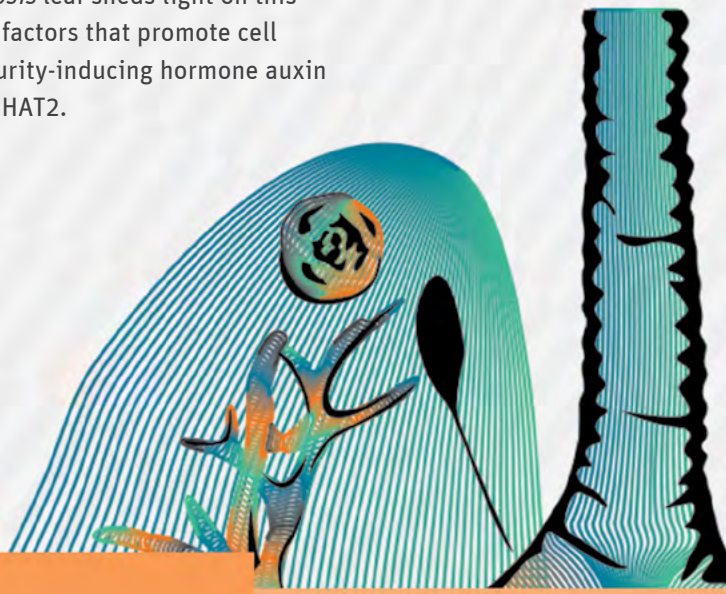
PREDATION RISK

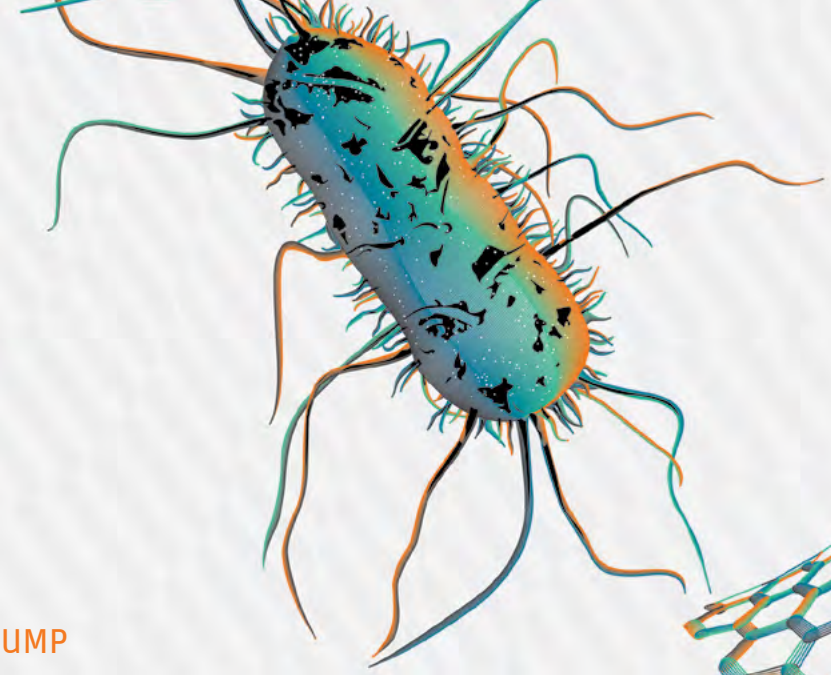
A long held assumption in animal behaviour is that conspicuous signals produced in the context of mate attraction makes the signaler more vulnerable to predators. However, in tree crickets, both signaling males (only males produce long-range calls) and responding females experience the same predation risk, according to a new study.

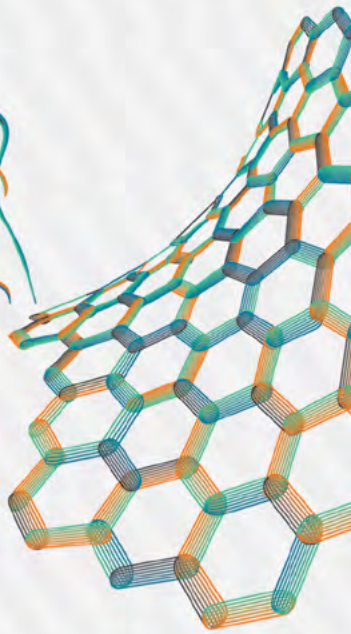


DIFFERENTIATION IN PLANT CELLS

Cells in young organs multiply before differentiating at maturity. How proliferating cells acquire differentiation potential has been unclear. The study of *Arabidopsis* leaf sheds light on this by identifying certain transcription factors that promote cell differentiation by boosting the maturity-inducing hormone auxin and activating the maturity protein HAT2.





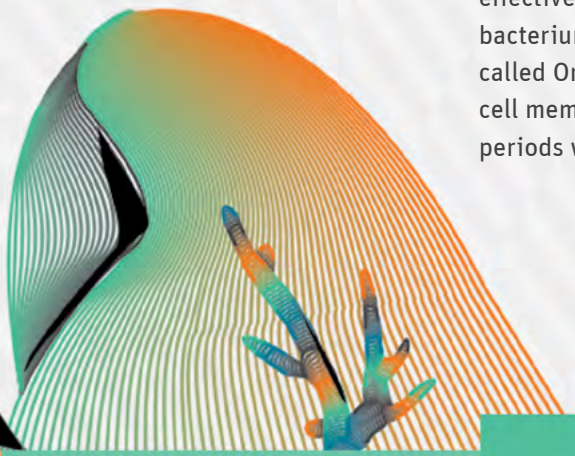


MOLECULAR SIGNAL JUMP

Researchers show that translational readthrough – continuation of protein translation beyond the stop codon – in a specific type of messenger RNA generates a novel type of the protein, which can inhibit the function of microRNAs involved in regulating protein synthesis. This work has significant implications in finding cures for various genetic disorders caused by nonsense mutations.

KILLING DRUG-RESISTANT BACTERIA

Researchers have designed an antimicrobial peptide that can effectively and quickly kill a notorious multidrug-resistant bacterium called *Acinetobacter baumannii.* The peptide, called Omega 76, kills the bacterium by breaking down its cell membrane. High doses of Omega 76 given for prolonged periods were not found to produce any toxic effects.



DIVISION OF

CHEMICAL SCIENCES

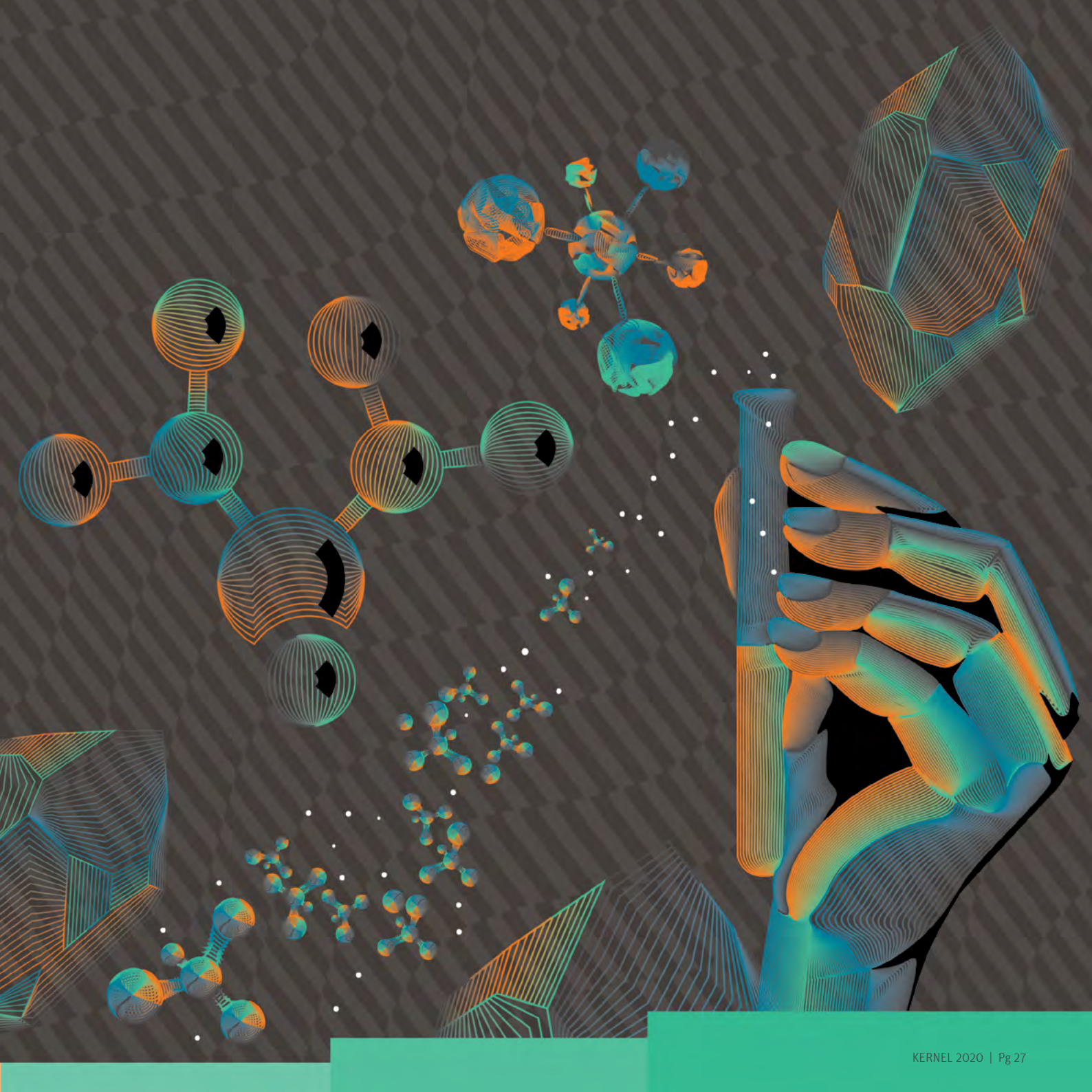
DEPARTMENT OF INORGANIC AND PHYSICAL CHEMISTRY

MATERIALS RESEARCH CENTRE

NUCLEAR MAGNETIC RESONANCE (NMR) RESEARCH CENTRE

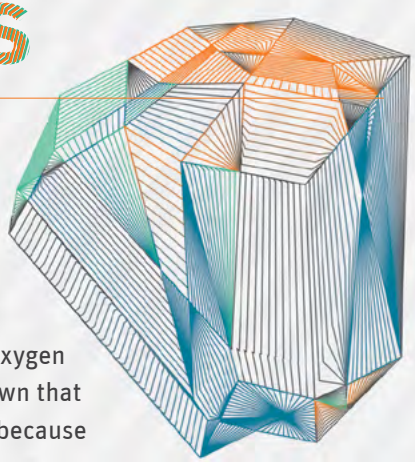
DEPARTMENT OF ORGANIC CHEMISTRY

SOLID STATE AND STRUCTURAL CHEMISTRY UNIT



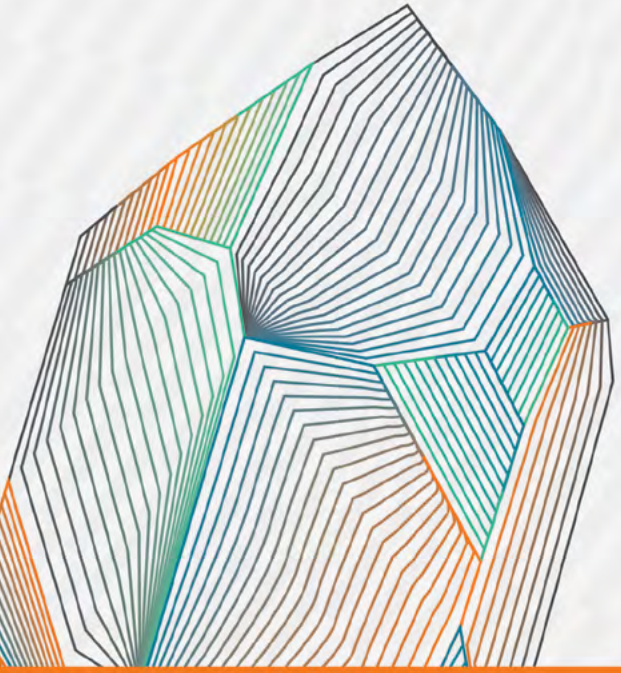
CHEMICAL SCIENCES

RESEARCH HIGHLIGHTS



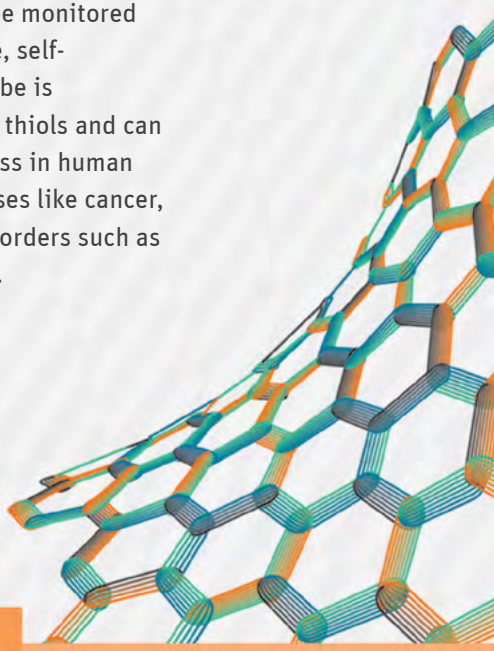
NOVEL ELECTROCATALYST IN ENERGY STORAGE SYSTEMS

At the heart of energy storage systems are catalytic reactions, particularly the oxygen reduction reaction and oxygen evolution reaction (OER). A recent study has shown that sodium cobalt metaphosphate can be used as a viable catalyst in such systems because of its superior OER activity and low cost.



UNDERSTANDING OXIDATIVE STRESS IN HUMAN CELLS

The formation of seleninic acid can be monitored in living cells by using a redox active, self-switching fluorescent probe. The probe is reversible in the presence of cellular thiols and can be used to understand oxidative stress in human cells, which is associated with diseases like cancer, diabetes, and neurodegenerative disorders such as Alzheimer's and Parkinson's disease.

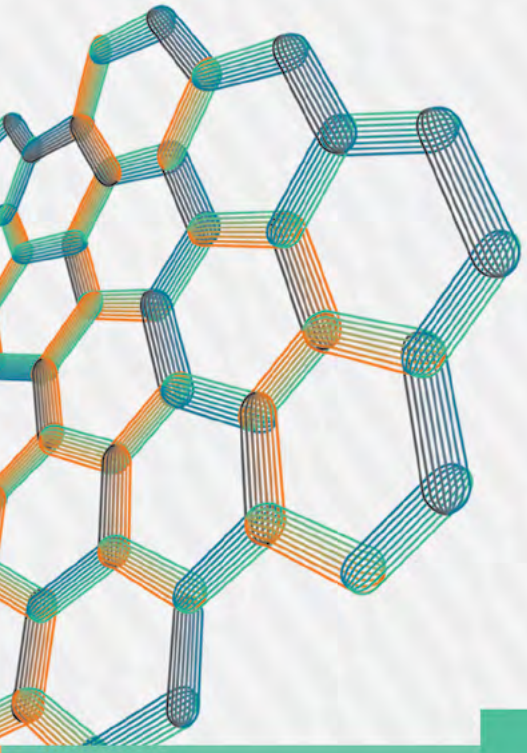


NEW MECHANISM FOR INTRAMOLECULAR SINGLET FISSION

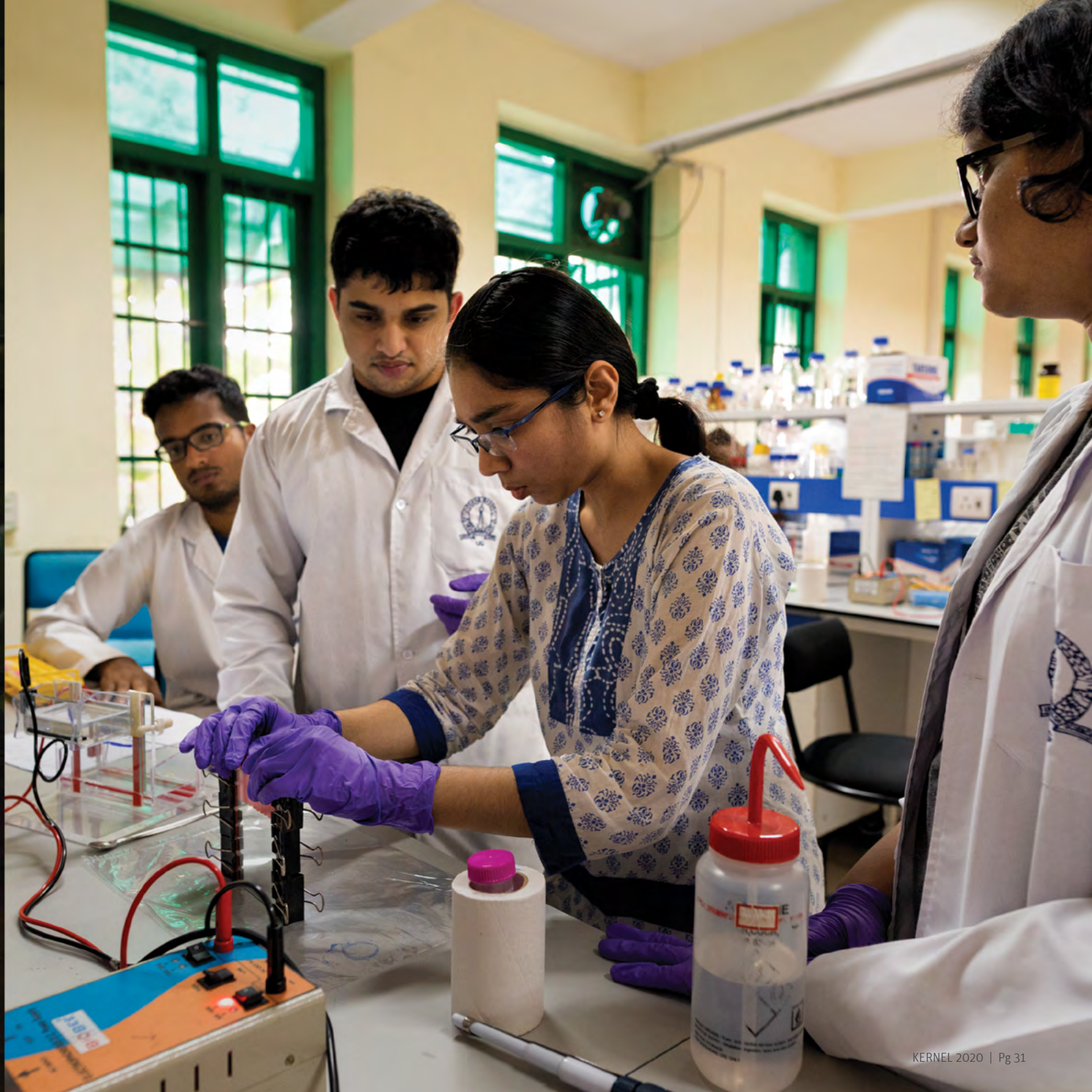
In solar cells, any photon absorbed with energy greater than the band gap of the material can potentially create one exciton. A research team has developed a process that produces two excitons at the expense of one photon, a development which can potentially enhance solar power conversion efficiencies.

INTEGRATING ARTIFICIAL INTELLIGENCE WITH MATERIALS SCIENCE

Materials Informatics Initiative of IISc (MI^3) is India's first interdisciplinary programme to integrate artificial intelligence with materials science. This initiative aims to develop machine learning models on computationally or experimentally generated big data to accelerate the discovery of inexpensive novel materials with exceptional properties.



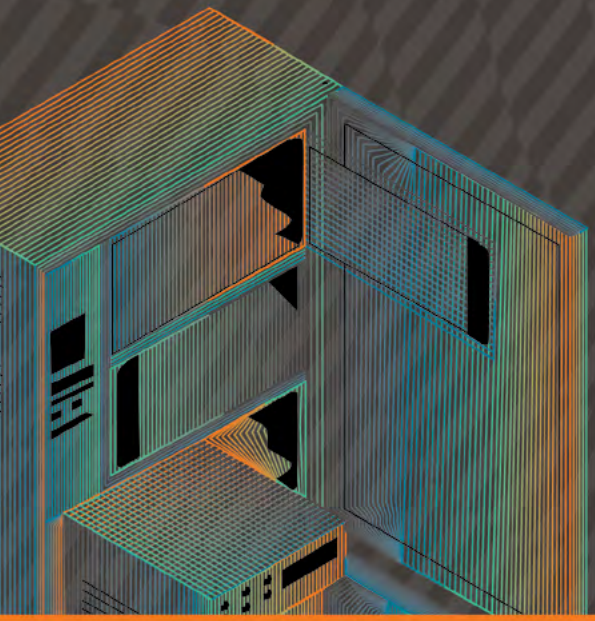

LIBRARY
J.R.D TATA MEMORIAL LIBRARY
NAMED AFTER THE GREAT MAN OF INDIA
J.R.D TATA

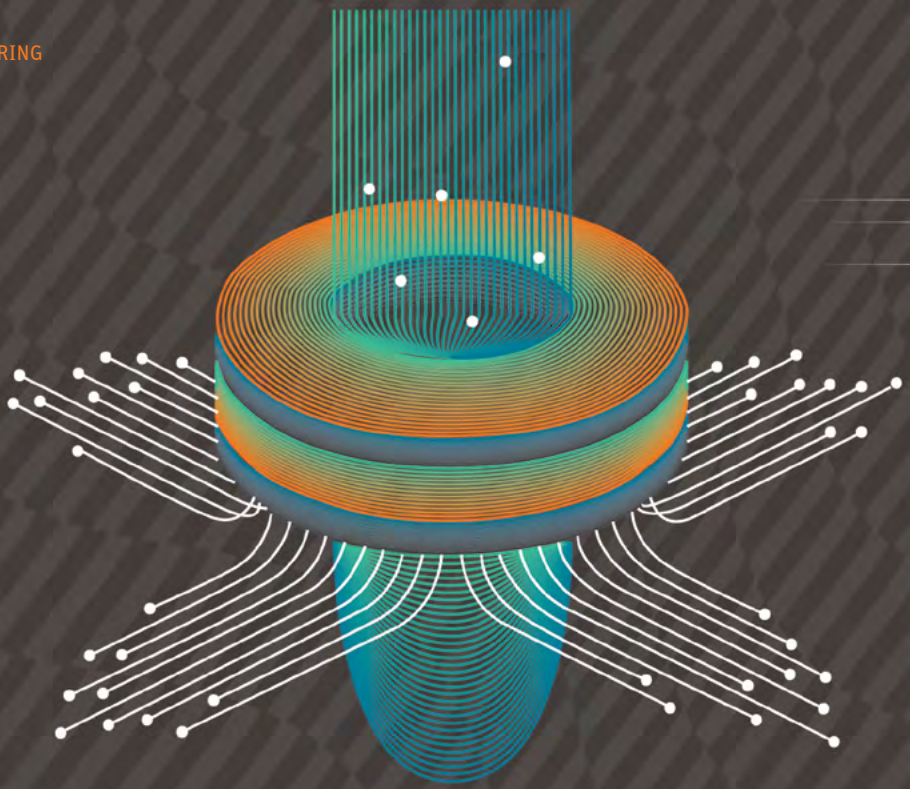


DIVISION OF

ELECTRICAL, ELECTRONICS AND COMPUTER SCIENCES

DEPARTMENT OF COMPUTER SCIENCE AND AUTOMATION
DEPARTMENT OF ELECTRICAL COMMUNICATION ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING
DEPARTMENT OF ELECTRONIC SYSTEMS ENGINEERING





ELECTRICAL, ELECTRONICS AND COMPUTER SCIENCES

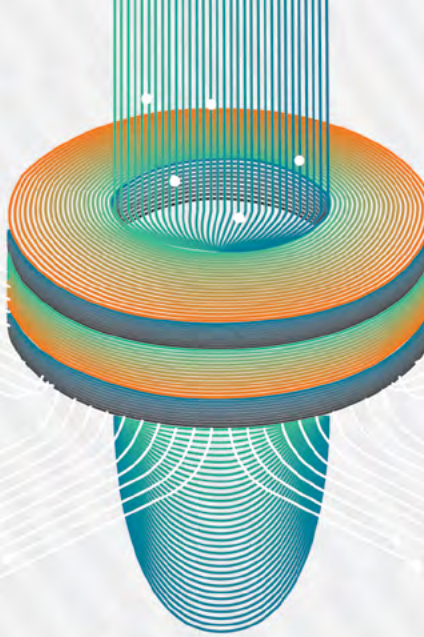
RESEARCH HIGHLIGHTS

ENSURING PRIVACY IN DRONE USE

Drones are becoming increasingly useful for sensing, search and rescue, and product delivery. But their widespread use poses risks for privacy and airspace. Researchers are developing tools that help hosts of restricted spaces specify privacy rules, and hardware that drones can use to comply. They also seek to influence India's emerging drone policies.

PROVIDING THREE-PHASE POWER IN RURAL AREAS

Power is usually supplied to remote and rural areas in a single phase. But farmers and small-scale industries typically use three-phase machines that are less expensive than single-phase ones. Researchers have developed an efficient and cost-effective Active Phase Converter that can provide three-phase power supply locally from a single-phase grid.

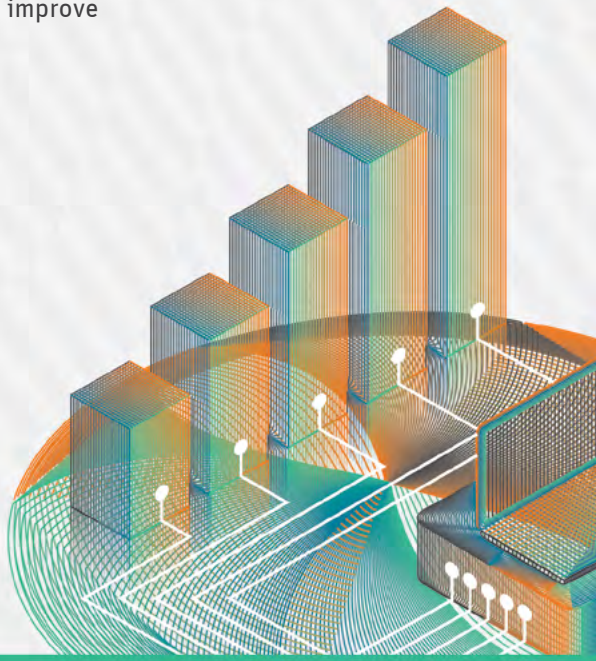


BRAIN-INSPIRED ARCHITECTURE FOR IoT DEVICES

The brain is an ideal template for next-generation computing architectures. Researchers have developed a hybrid architecture that combines a silicon neuron, acting as the computing unit, with a 2D nanosheet of molybdenum sulphate, acting as a memristor that works like a synapse. This can improve power use and performance in IoT-based devices.

RELIABLE, FAST COMMUNICATION FOR 5G APPLICATIONS

Ensuring reliable, low-latency communication is key to next-generation 5G applications such as multiplayer gaming, augmented and virtual reality, autonomous vehicles and telesurgery. Towards this goal, researchers have developed best-in-class, packet-level, erasure-recovery schemes. This work was among the finalists for the IEEE ISIT Jack Wolf Student Paper Award and received a Qualcomm Innovation Fellowship.

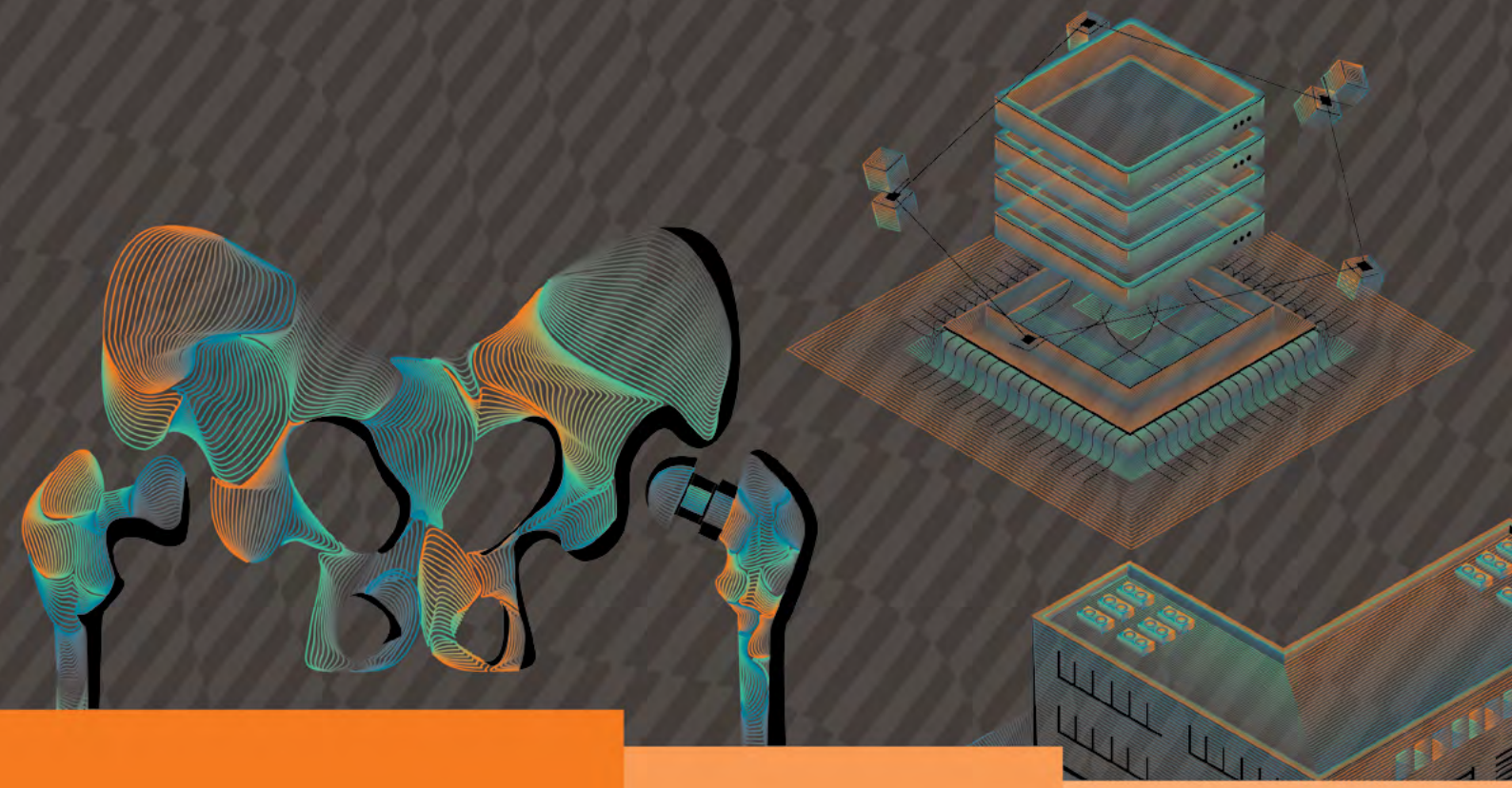


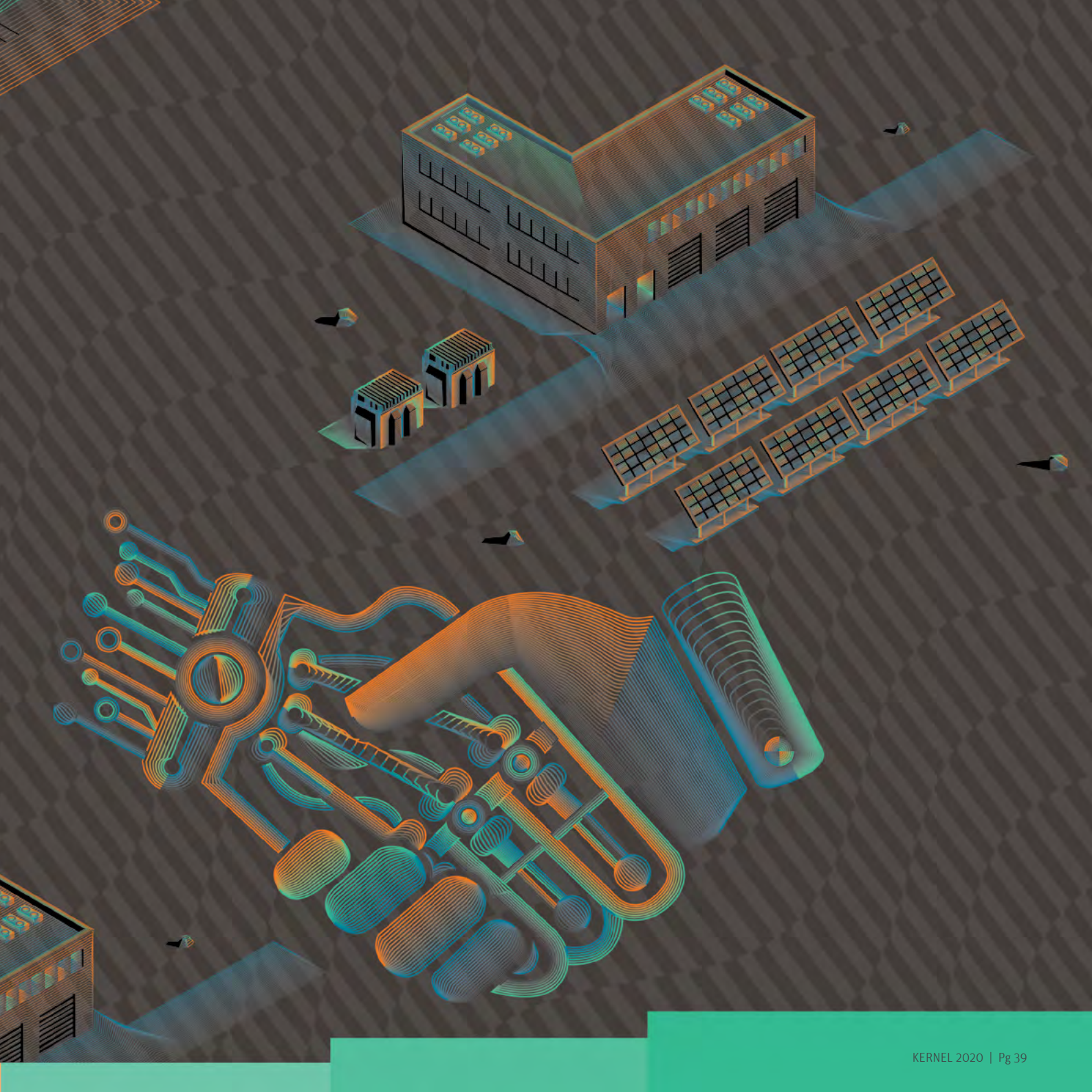

E=MC
Theory of Relativity
V=IR
P.E.=mgh
$R_{\mu\nu} + \frac{1}{2}RG_{\mu\nu} + \lambda G_{\mu\nu} = \frac{8\pi\gamma}{G}$

DIVISION OF

INTERDISCIPLINARY RESEARCH

CENTRE FOR BIOSYSTEMS SCIENCE AND ENGINEERING
CENTRE FOR SOCIETY AND POLICY
CENTRE FOR INFRASTRUCTURE, SUSTAINABLE TRANSPORTATION AND URBAN PLANNING
CENTRE FOR NANO SCIENCE AND ENGINEERING
DEPARTMENT OF COMPUTATIONAL AND DATA SCIENCES
DEPARTMENT OF MANAGEMENT STUDIES
INTERDISCIPLINARY CENTRE FOR ENERGY RESEARCH
INTERDISCIPLINARY CENTRE FOR WATER RESEARCH
ROBERT BOSCH CENTRE FOR CYBER PHYSICAL SYSTEMS
SUPERCOMPUTER EDUCATION AND RESEARCH CENTRE

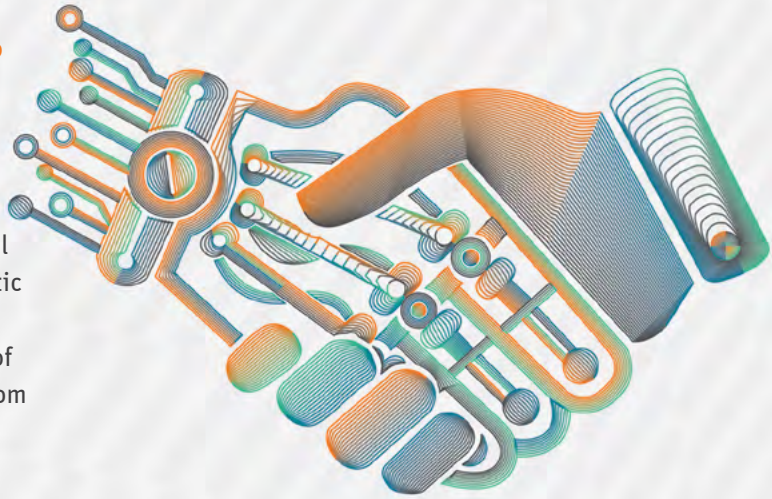




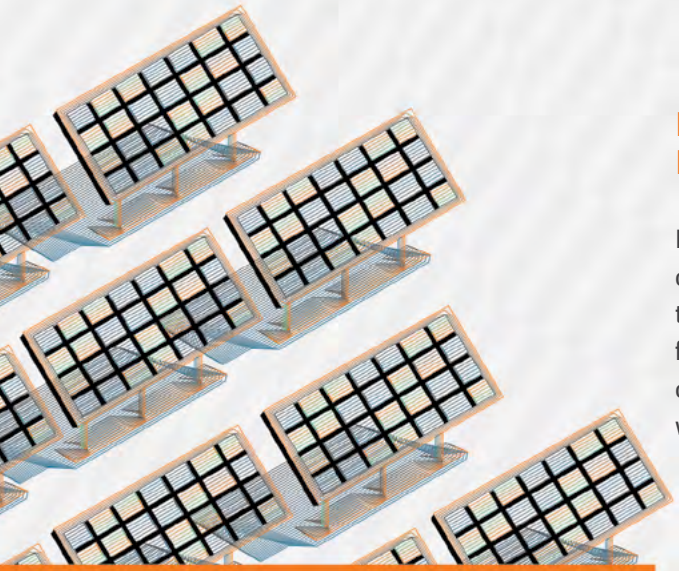
INTERDISCIPLINARY RESEARCH

RESEARCH HIGHLIGHTS

ROBOTS LEARN TO WALK THROUGH DEEP REINFORCEMENT LEARNING

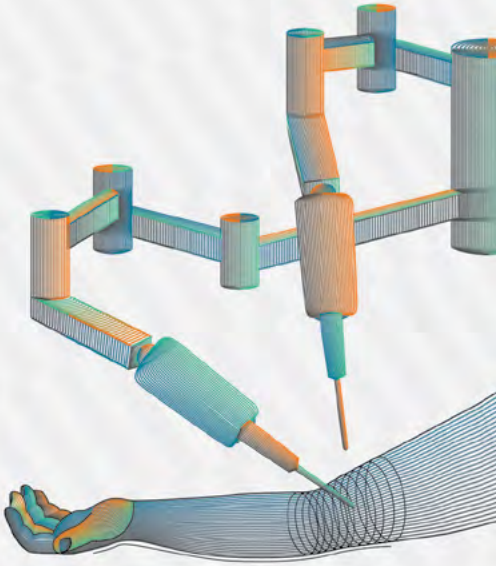


Humans and other animals are believed to use a minimal set of trajectories to perform tasks such as walking. Researchers have developed an effective tool to realise these basic motion patterns, called kinematic motion primitives, via trajectories learned from deep reinforcement learning and, from them, realise a set of behaviours – trot, walk, gallop and bound – in a custom four-legged robot called “Stoch”.



MECHANISM THAT REGULATES MITOCHONDRIAL FISSION

Mitochondria in a cell are bound to cytoskeletal structures called microtubules. A recent study shows that attachment to microtubules is essential to maintain the balance between fission and fusion of mitochondria. This gives insight into how one might be able to restore mitochondrial function in diseases where they are affected by changing microtubule dynamics.

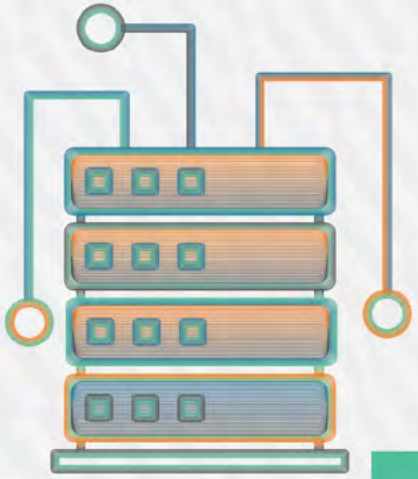


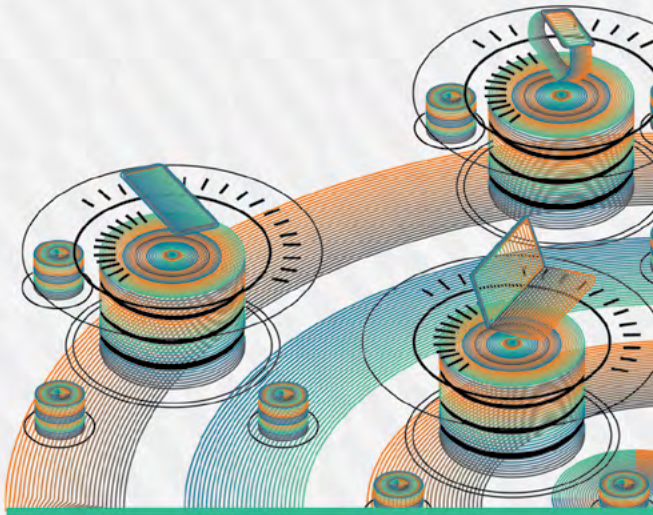
MORE GENERALISABLE AND ADAPTABLE DEEP LEARNING MODELS

Recent advances in deep learning use algorithms/models that are not effective across a range of inputs and applications. A recent study proposes an unsupervised multi-task adaptation framework that is more generalisable. This reduces the data dependency of deep learning models and enables those trained only on controlled synthetic environments to adapt to unknown natural scenarios.

COLLOIDAL TWEEZERS TO TRANSPORT NANOSCALE CARGO

Researchers have developed a “tweezer in a tweezer” technique to trap and move nano-sized particles in a fluidic medium using only light. It uses a focused laser beam to trap and manoeuvre a nano-sized silver disk, which in turn can attract and ensnare nanoparticles when light is shined on it.





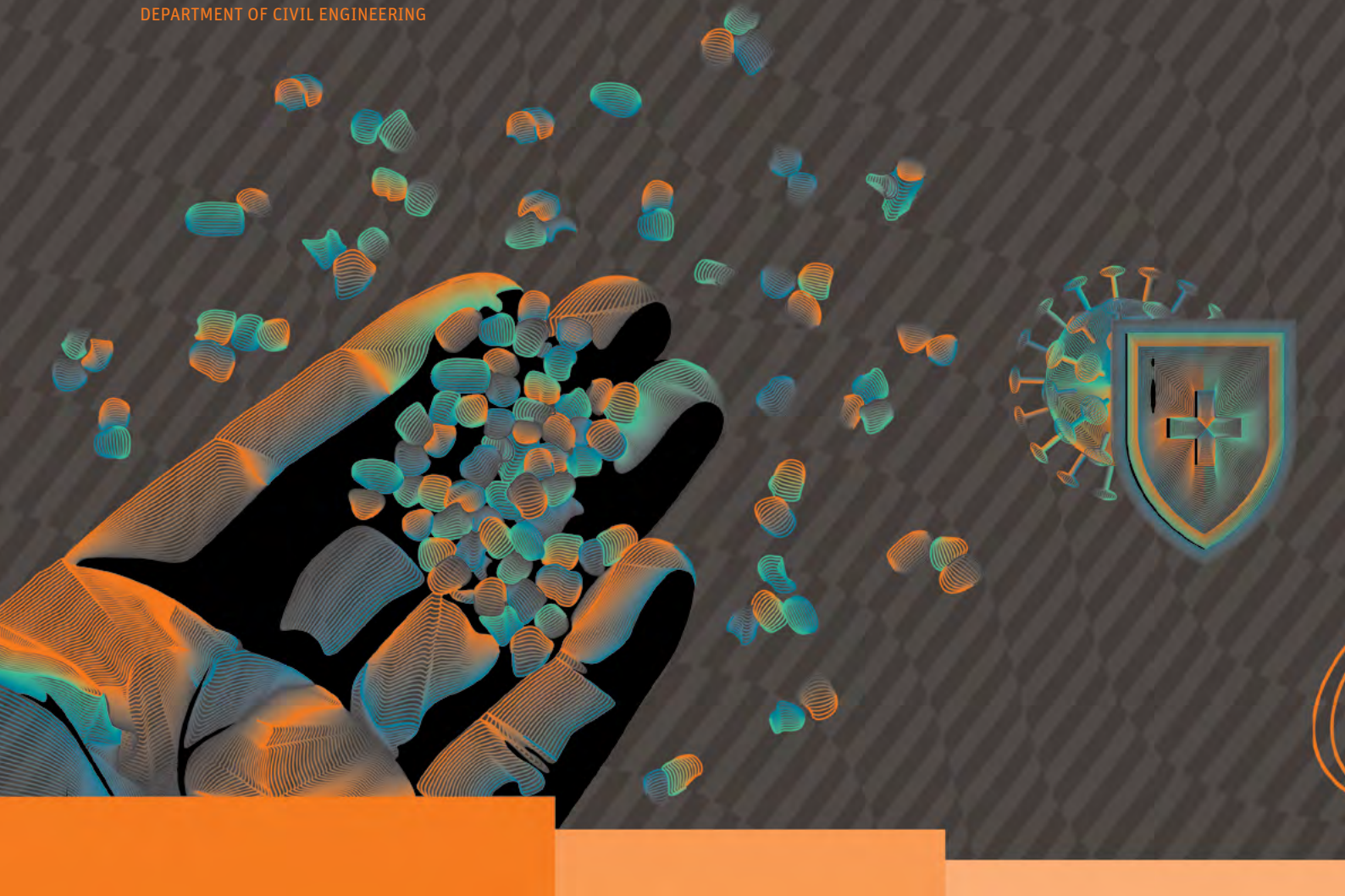

RANKEM
SPECTROCHEM

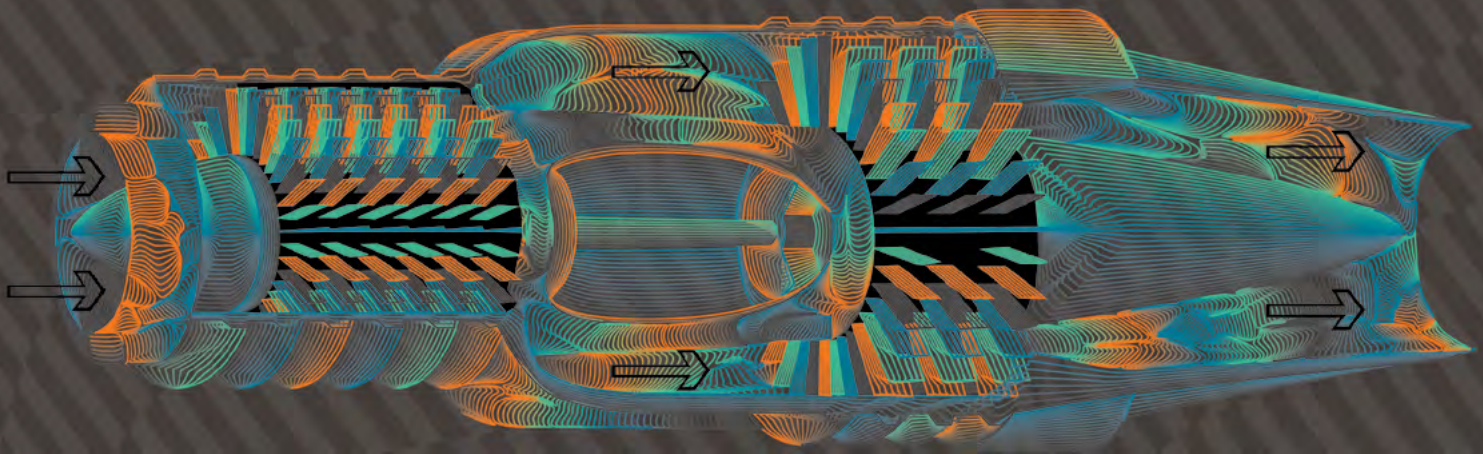
DIVISION OF

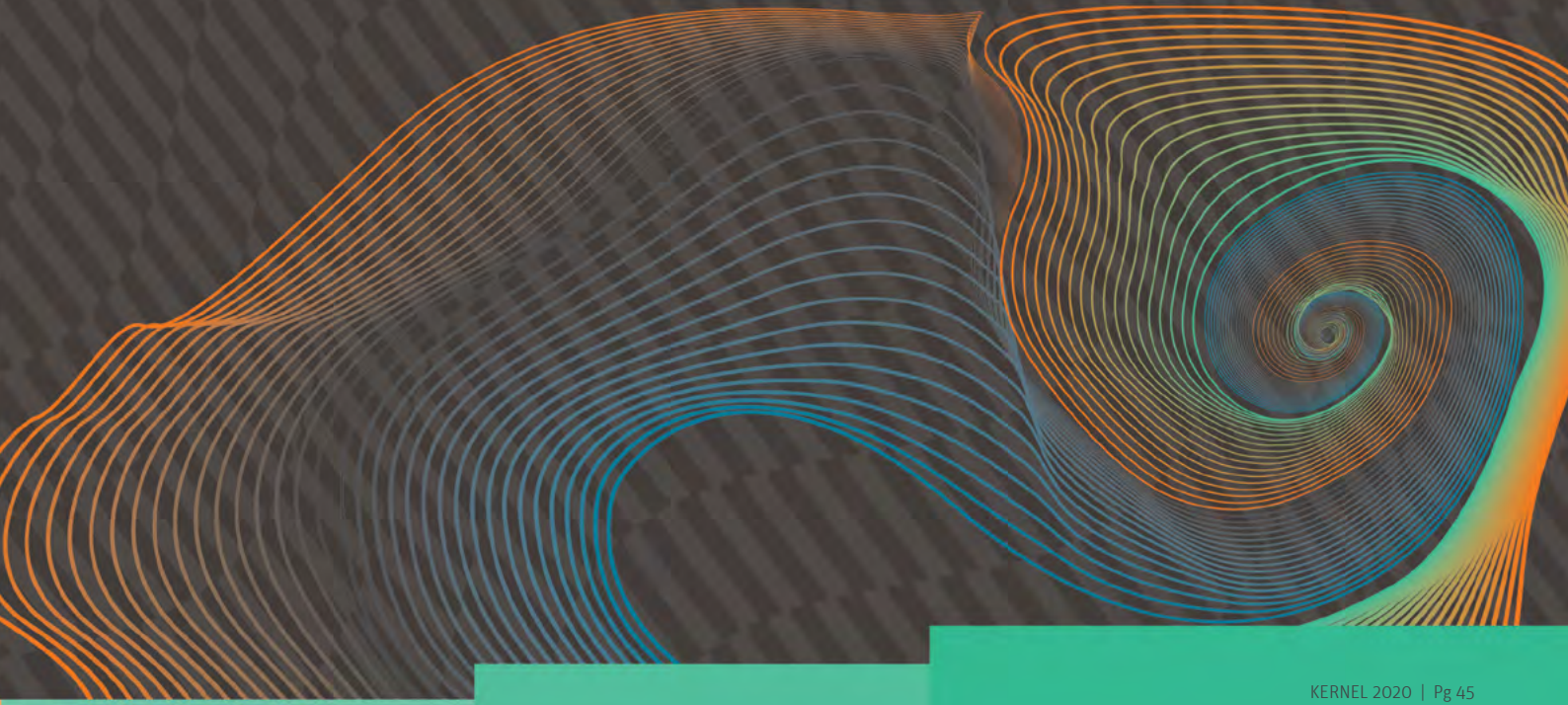
MECHANICAL SCIENCES

DEPARTMENT OF AEROSPACE ENGINEERING
CENTRE FOR PRODUCT DESIGN AND MANUFACTURING
DEPARTMENT OF CHEMICAL ENGINEERING
DEPARTMENT OF MATERIALS ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
DEPARTMENT OF CIVIL ENGINEERING

CENTRE FOR EARTH SCIENCES
CENTRE FOR ATMOSPHERIC AND OCEANIC SCIENCES
CENTRE FOR SUSTAINABLE TECHNOLOGIES
DIVECHA CENTRE FOR CLIMATE CHANGE
CENTRE OF EXCELLENCE IN ADVANCED MECHANICS OF MATERIALS





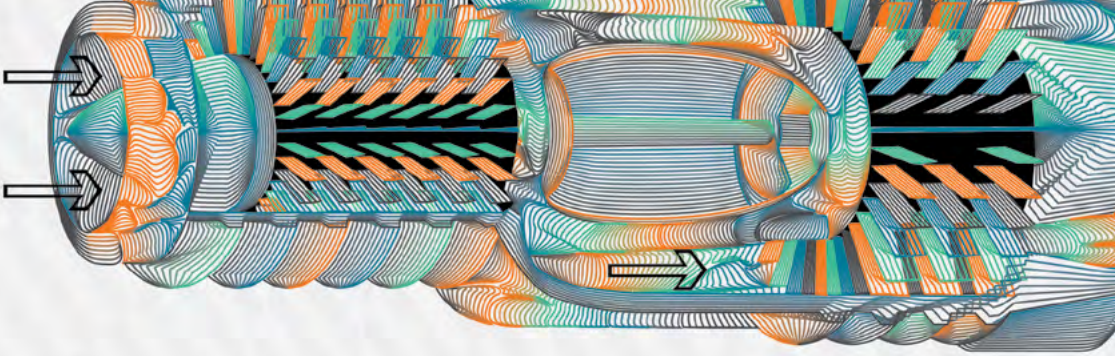


MECHANICAL SCIENCES

RESEARCH HIGHLIGHTS

UNDERSTANDING FACTORS THAT HAVE INFLUENCED CHANGES IN THE MONSOON IN THE PAST

To predict how monsoons will evolve, we need to understand how they have changed in the past, especially the role of solar forcing versus factors internal to the climate system. A recent study uses results from a transient climate simulation to demonstrate that insolation drives monsoon through different pathways during cold and warm periods, highlighting the changing role of internal factors.



A MODEL TO ESTIMATE DRUG-RESISTANT HEPATITIS C VIRUS VARIANTS

Drug-resistant variants of hepatitis C virus that may exist in an infected individual – and remain undetected – define the drug resistance pathways accessible to the virus at the start of treatment. Researchers have constructed a mathematical model to estimate pre-treatment levels of the spectrum of virus mutants resistant to a given drug, providing a framework for identifying optimal drug treatments and vaccine designs.

A GUIDANCE SCHEME FOR SOFT LANDING OF SPACECRAFT ON LUNAR SURFACE

A recent study presents a waypoint constrained multi-phase nonlinear optimal guidance scheme for the soft landing of a spacecraft on the lunar surface. The proposed guidance ensures that the spacecraft passes through two waypoints meeting constraints such as position, velocity, and attitude of the spacecraft, in addition to minimising fuel consumption.

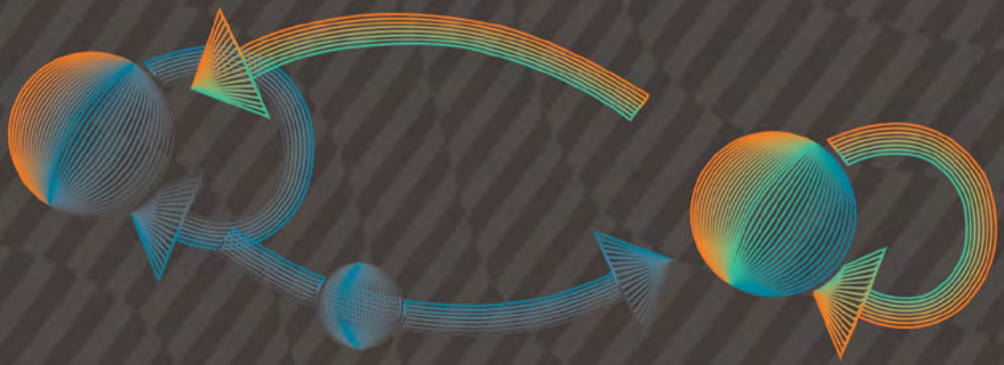
INFERRING CELLULAR DYSFUNCTION THROUGH CHANGES IN ITS MORPHOLOGY

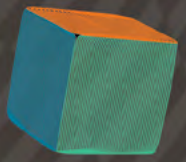
Abnormalities in the morphology of a cell's nucleus are predictors of cellular dysfunction and diseases such as cancer. By modeling the liver cell's nucleus as an inflated balloon flattened under a force, researchers have found a way to estimate the consequences of hepatitis C virus infection from nuclear volume and surface area.

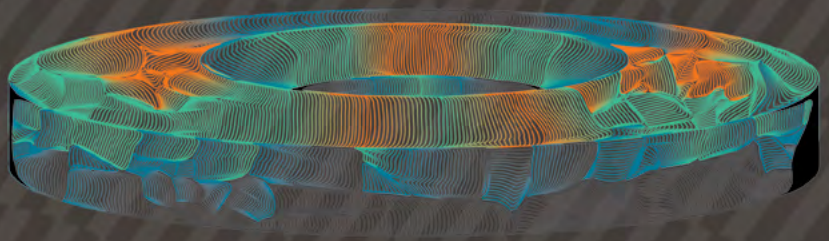
DIVISION OF

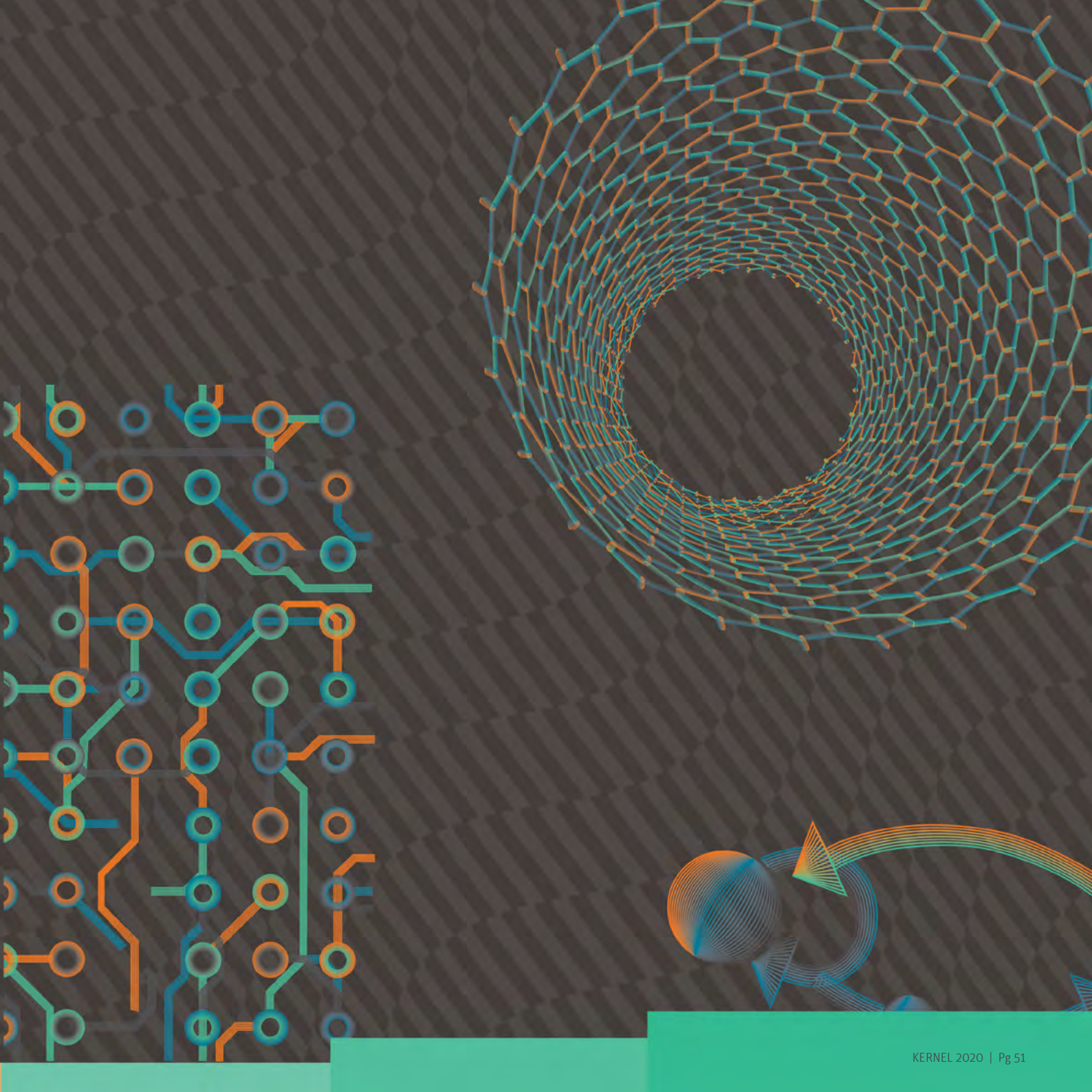
PHYSICAL AND MATHEMATICAL SCIENCES

CENTRE FOR CRYOGENIC TECHNOLOGY
CENTRE FOR HIGH ENERGY PHYSICS
DEPARTMENT OF INSTRUMENTATION AND APPLIED PHYSICS
DEPARTMENT OF MATHEMATICS
DEPARTMENT OF PHYSICS







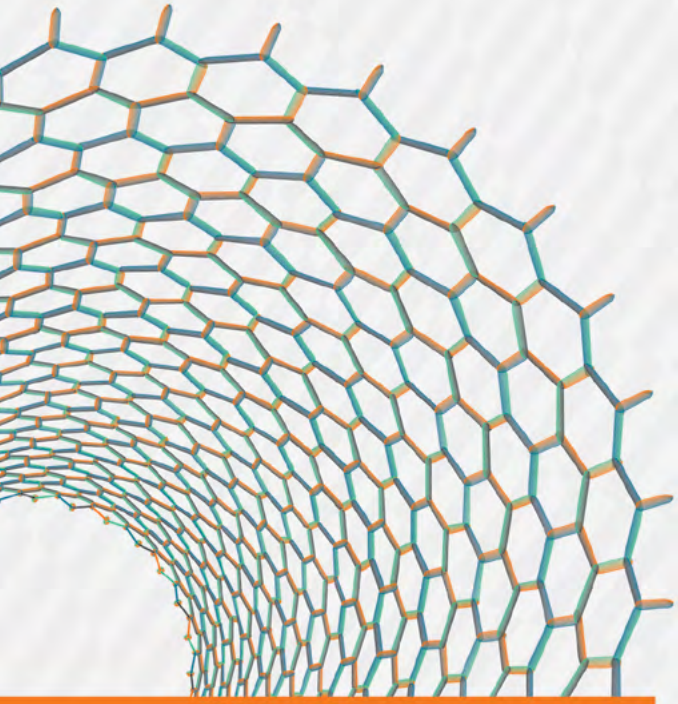


PHYSICAL AND MATHEMATICAL SCIENCES

RESEARCH HIGHLIGHTS

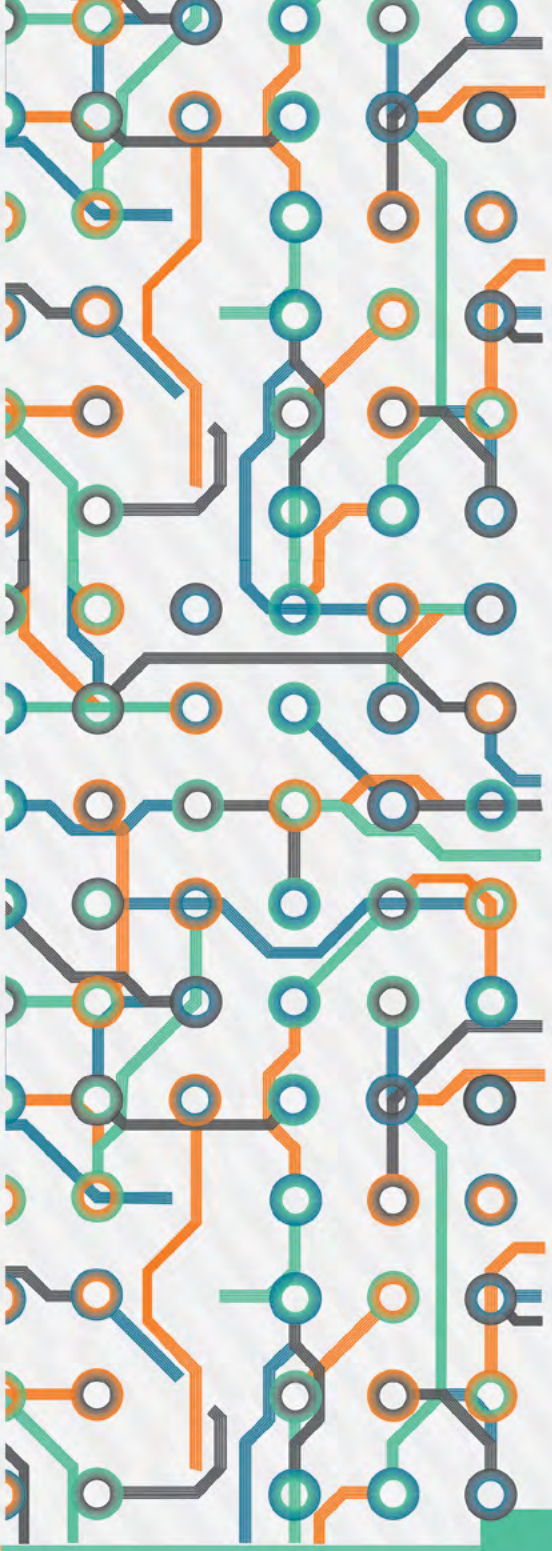
OPTOMECHANICAL DEVICE FOR READOUT AND CONTROL OF LOW-TEMPERATURE SYSTEMS

A new study presents design and measurements on an optomechanical device based on a 3D rectangular waveguide cavity. By modifying the electromagnetic field corresponding to the fundamental mode of the cavity, the equivalent circuit capacitance can be reduced. By coupling a mechanical resonator to the modified electromagnetic mode of the cavity, an improved capacitance participation ratio can be achieved.



MACHINE LEARNING MAY HELP SEARCH FOR PHYSICS BEYOND THE STANDARD MODEL

The search for physics beyond the Standard Model is an important thrust area in the work at the Large Hadron Collider at CERN. A study demonstrates that convolutional neural networks are useful in predicting long-lived particles giving rise to displaced jets. This suggests that modern machine learning techniques have the potential to discriminate between energy deposition patterns of prompt and long-lived particles.



SELF-HEALING INTERCONNECTS FOR FLEXIBLE ELECTRONIC CIRCUITS

Open-circuit failure-resistant interconnect is a key technology to enable reliable flexible electronic circuits. Using a dispersion of conductive particles in an insulating fluid, researchers studied the physics and engineering behind self-healing interconnects where repair is automatically triggered when an open fault occurs. The work also demonstrates heals having metallic conductivity and nearly plastic stretchability.

RANDOM MOTION ON FINITE RINGS

A new study proves formulas for eigenvalues and multiplicities of the transition matrices of irreversible Markov chains on finite commutative rings randomly generated using both addition and multiplication. This is restricted to the case where the addition is uniformly random and multiplication is arbitrary. In addition, it proves explicit formulas for the probabilities for finite chain rings when multiplication is also uniformly random.


TARSONS
MICRO TIP

WATER RESEARCH

Researchers at IISc are using interdisciplinary approaches to address various challenges related to water

AREAS OF FOCUS

HYDROLOGY AND WEATHER SYSTEMS

AVAILABILITY OF CLEAN WATER

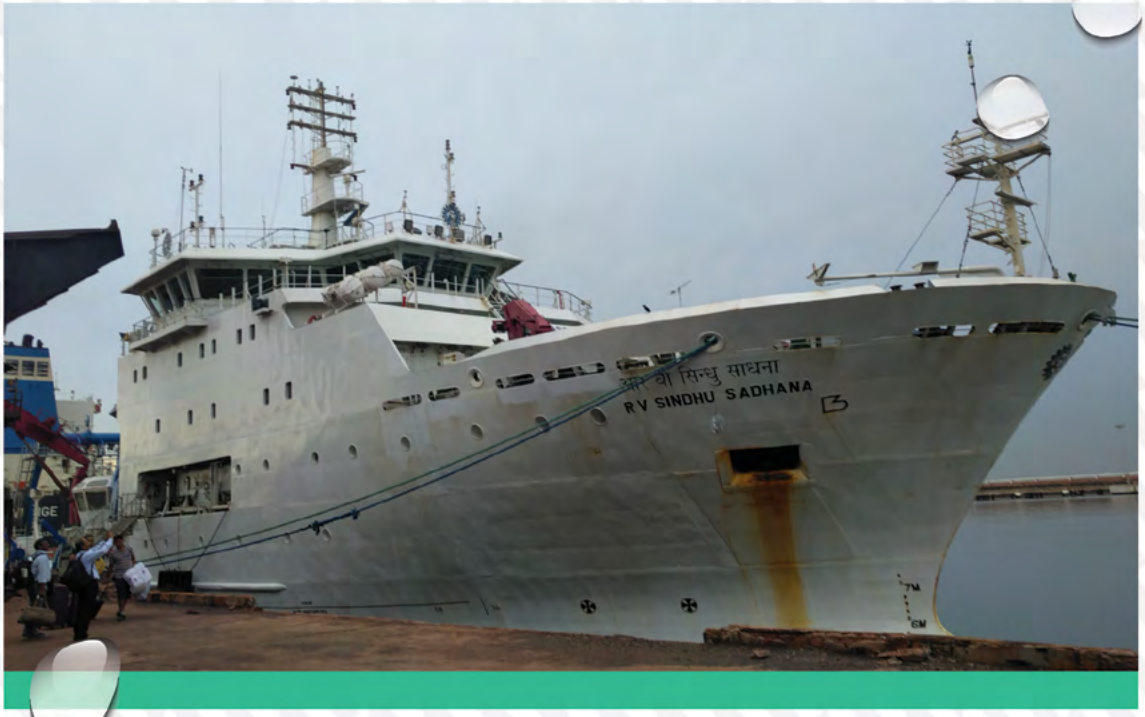
DETECTION AND IMPACT OF CLIMATE CHANGE

URBAN WATER SYSTEMS

OUTREACH

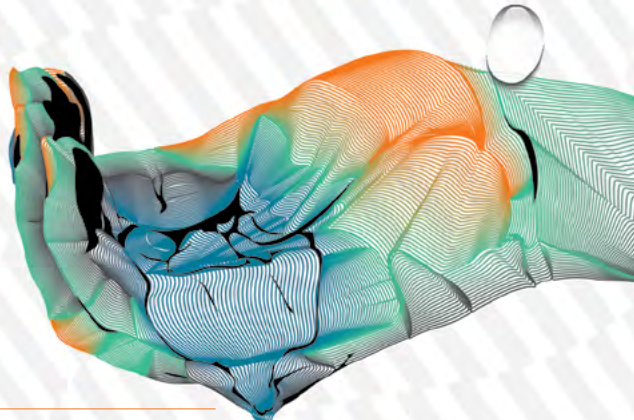
BOBBLE

The Bay of Bengal Boundary Layer Experiment is part of a major effort to learn more about the monsoon, which has a large effect on India's agriculture and economy. Being able to forecast weather accurately could have significant consequences for agriculture and minimise damage to property and disruption of lives.



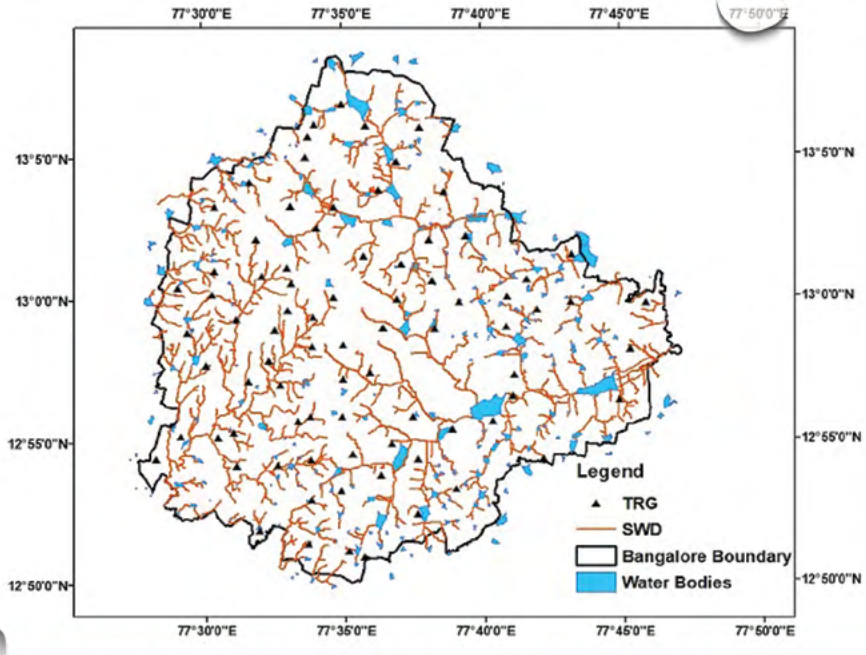
EQWATER

To achieve equity in water distribution, IISc, along with the Bangalore Water Supply and Sewerage Board, is using IoT technologies of sensing and communications, along with advanced models of hydraulics, algorithms for controls, optimisation and scheduling. A pilot project will be taken up at a service station to offer guidelines for better management.



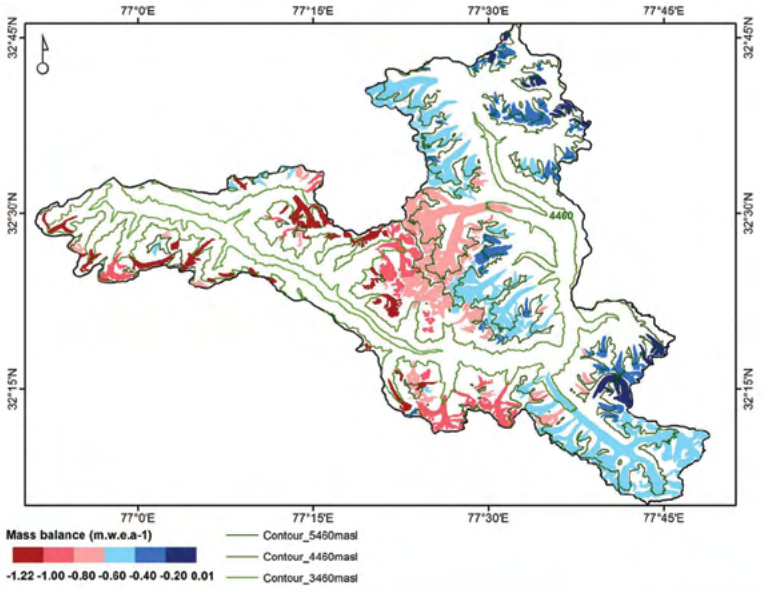
URBAN FLOOD MODEL

IISc, along with the Karnataka State Natural Disaster Monitoring Centre, is developing an urban flood model capable of simulating hydrologic and hydraulic behavior of storm water in existing and natural drainage systems, using high resolution terrain data. It also aims to use flood water to improve Bangalore's groundwater levels and rejuvenate lakes.



GLACIERS

Satellite data and local data on temperature and snowfall have been used to measure the decline of ice in glaciers in the Chandra Basin in Himachal Pradesh. At the Lhonak Glacier in Sikkim, scientists are also studying whether glacial lakes, formed by melting glaciers, pose a flood threat to people living downstream, and how this can be mitigated.



WATER FUTURE CONFERENCE

In September 2019, IISc hosted an international conference with over 30 keynote speakers and around 700 participants from across the globe. It addressed a number of factors including the global water crisis, search for sustainable solutions, connected issues such as poverty, nutrition, health, education, gender, equity and productivity, and water governance settings at different levels.

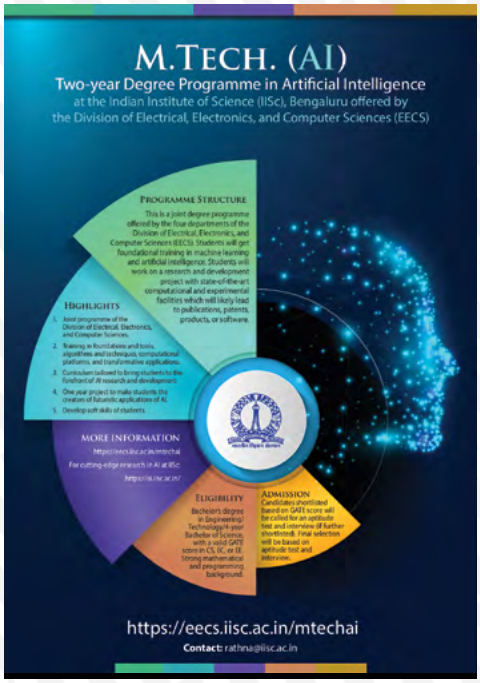
NEW INITIATIVES

CLEAN COAL R&D

A National Centre for Clean Coal Research and Development (NCCCR&D) has been set up at IISc with support from the Department of Science and Technology, Government of India. It was inaugurated on 16 September 2019 by Dr Harsh Vardhan, Honourable Union Minister of Science and Technology, Earth Sciences, Health and Family Welfare.

The Centre aims to address R&D challenges in developing clean coal technologies that are critical for India to achieve its targets on climate change, and address its growing energy demand. This will include cutting-edge research on high-efficiency advanced ultra-supercritical steam power plants and supercritical carbon dioxide (SCO_2)-based Brayton cycle power plants. Efforts will also focus on developing new combustion and gasification technologies.

MTech IN ARTIFICIAL INTELLIGENCE



IISc has launched a two-year MTech degree programme in Artificial Intelligence (AI), to be offered jointly by the four departments under the Division of EECS. The programme aims to impart rigorous training in foundations and tools, algorithms and techniques, computational platforms and transformative applications related to AI.

Candidates shortlisted based on GATE scores will be called for an aptitude test and interview, which will determine the final selection. About 40 students will be admitted each year, and they will divide their time between the four EECS departments. Students will also have the opportunity to work on a one-year research project using state-of-the-art computational and experimental facilities, leading to new publications, patents, products or software.

SMART FACTORY

IISc has established a smart factory facility called “Industry 4.0 India @ IISc” that will act as a Common Engineering Facility Centre (CEFC) under the Samarth Udyog Bharat 4.0, Department of Heavy Industry (DHI). It was inaugurated by Dr AR Sihag, DHI Secretary, on 13 December 2019.

CEFC aims to develop smart factory platforms that will serve as demonstrators for industries to test technologies and solutions, and create variants of future factories. A variety of technologies including smart inspection systems, 3D printing systems and assembly support systems are being developed. The Centre will also support new innovations and startups, and conduct awareness and training programmes, especially in advanced manufacturing.

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