

STRIDES

Science, Technology, Research, Innovation & DEvelopmentS

BRINGS NEWS ON S&T DEVELOPMENT FROM DST SUPPORT AND BEYOND

EDITORIAL

FROM HEAD OF DST MEDIA CELL

The Department of Science and Technology (DST) welcomes 2021 with 2020, as a year full of scientific achievements that include, supporting the nation to navigate the pandemic with a slew of technologies and innovations that came as solutions to fight the crisis.

The year 2020 witnessed some major successes in science, technology and innovation in the country. India is placed among top three nations in the scientific publication as per NSF database and featured within the top 50 innovative economies globally as per Global Innovation Index (GII). The draft of the 5th National Science Technology and Innovation Policy has been finalized and released for public consultation.

DST made some outstanding contributions towards combating COVID-19. The Centre for Augmenting War with COVID 19 Health Crisis (CAWACH) initiative that was designed to identify, map and scale up innovations to combat COVID 19 led to scale up of numerous solutions to detect infections, contain its spread, manage the crisis and treat it. Detection kits, environment friendly, skin-friendly disinfectants, apps to map infected areas and manage health care solutions, prediction models were developed and reached out to the affected population.

As the department focused on capacity building, new super-computing facilities were set up increasing the computing power of the nation, 25 innovation hubs and parks have been set up on new and emerging technologies like quantum mechanics and machine learning. Three Sophisticated Analytical & Technical Help Institute (SATHI) Centres set up as were climate change centres in three Himalayan Universities.

The department also made firm forays into geospatial mapping, policies for opening up science, reaching it to the people and ensuring equity at all levels of Science Technology Engineering and Mathematics. Numerous schemes have been started and implemented, and DST looks forward to see them fructify in the new decade as harbingers of change.

—DR AKHILESH GUPTA, EDITOR-IN-CHIEF

COVER STORY



CII INDUSTRIAL INNOVATION AWARDS 2020 CONFERRED AT DST-CII TECH SUMMIT

The CII Industrial Innovation Awards 2020 were conferred by Secretary DST, Government of India and Past President, CII

& Chairman, CII National Startup Council Mr. Kris Gopalakrishnan, to a total of 27 companies for processes, products, services, technologies, and other types of innovations which have the ability to fuel growth in the industry, at the 26th DST CII Technology Summit 2020.

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GITA IS A CATALYST FOR NURTURING INNOVATION & INDUSTRIAL R&D BY FOSTERING BILATERAL ACADEMIC-INDUSTRY & GOVERNMENT COLLABORATIONS: DR. HARSH VARDHAN

Dr. Harsh Vardhan, Union Minister of Science & Technology, Health and Family Welfare and Earth Sciences, Govt. of India, underlined how Global Innovation and Technology Alliance (GITA) served as a catalyst

for nurturing innovation and industrial R&D by fostering bilateral academic industry and government collaborations, through a video message at celebration of the 9th Foundation Day of GITA.

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From Head of DST Media Cell Covid News Highlights

Cover Story

INSIDE THE E-NEWSLETTER

Popular Science Stories

New Initiatives

DST Achievements

COVID NEWS HIGHLIGHTS



Indian economy to bounce back soon from effects of COVID 19: NITI Aayog Vice Chairman

Vice-Chairman, NITI Aayog, Dr. Rajiv Kumar, emphasised that the Indian economy would be among the top economies in the world in the next few years using science, technology, and innovation in all sectors, bouncing back soon after the effects of COVID 19, at a webinar organized to

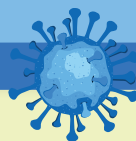
celebrate 50 years of DST.

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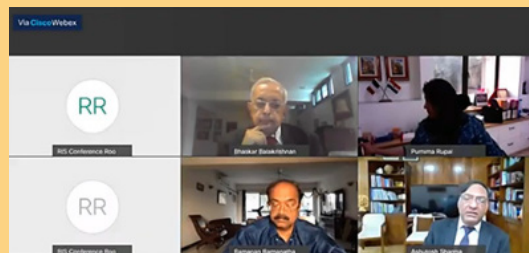
Experts discuss how STIP 2020 can help country become future-ready & face situations like COVID-19

Dr. V.K. Saraswat, Member, Niti Aayog highlighted how COVID 19 created opportunities and will have profound long-term consequences while Prof Ashutosh Sharma, Secretary, DST, underlined how STIP 2020 would make us future-ready to face such situations, at a webinar.

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POPULAR SCIENCE STORIES



Multidisciplinary approach needed to address the challenges of the future: DST Secretary

DST Secretary Professor Ashutosh Sharma highlighted the importance of a multidisciplinary approach to address the challenges of the future at the 31st STIP Forum Lecture. "Multidisciplinary approach is the foundation. The bifurcated disciplines are layers created just for our comfort. These can be demolished as they run out of steam," Professor Sharma pointed out at the lecture on 'The Art of Science in the Brave New World'

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SwarnaJayanti Fellow working on generating phonons that can help in thermal insulation & waste heat transformation

Scientists are trying to generate sources for single and entangled Phonons (or quantised sound waves) that can have applications in thermally insulating buildings, reducing environmental noise, transforming waste heat into electricity, and developing earthquake protection.

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NEW INITIATIVES

▶ Indo-German Science & Technology Centre (IGSTC) Call 2020

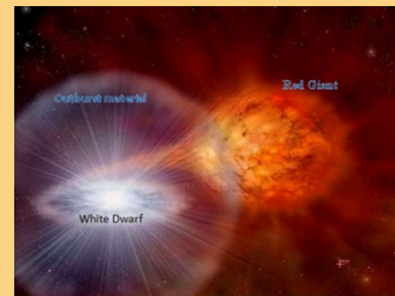
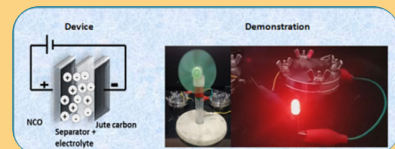


Figure: An artist rendition of a recurrent nova outburst.

Study of stellar outburst gives a clue to properties of rare binary star system called symbiotic recurrent nova

On August 28, 2019, Astronomers observed a rare explosion in space. They identified it as emanating from an interacting binary star system called V3890 Sgr, a symbiotic recurrent nova, and monitored the extended outburst.

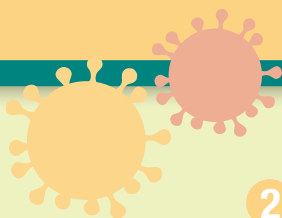
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Scientists develop high-performance hybrid supercapacitors with novel electrode material

Scientists have developed a low-cost supercapacitor device with excellent capacitive retention with a novel electrode material they have synthesized, which can pave the way for the next generation high power-high energy storage devices.

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SwarnaJayanti Fellow to work on Metal CO₂ battery which can reduce payload mass & launch costs of planetary missions

Chandra Shekhar Sharma, Associate Professor from Department of Chemical Engineering, IIT Hyderabad and a recipient of this year's Swarnajayanti fellowship instituted by DST, Government of India, will be working to develop Scientific Understanding and Technical Development of Metal- CO₂ battery with CO₂ as an Energy Carrier for India's Mars Mission.

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A tough species of Muraingrass identified in the plateaus of Western Ghats of Goa named after Goa University Professor

A new species of Indian Muraingrasses known for their ecological and economic importance, such as fodder, have been spotted by scientists in Goa in the Western Ghats, one of the four global biodiversity hotspots of India.

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Supercapacitors step-up voltage window using organic nanofibres

Scientists have developed energy storage devices with stepped-up voltage window using organic nanofibres, which can serve as miniaturized energy source for supplying small packets of energy to the various electronic gadgets that would be needed for the lifestyle of the future.

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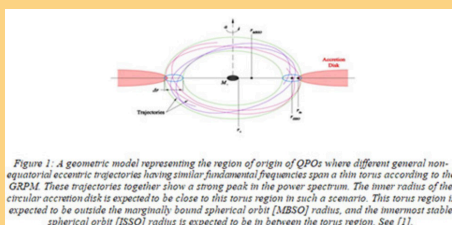


Figure 1: A geometric model representing the region of origin of QPOs where different general non-equatorial eccentric trajectories having similar fundamental frequencies span a thin torus according to the GRM. These trajectories together show a strong peak in the power spectrum. The inner radius of the circular accretion disk is expected to be close to this torus region in such a scenario. This torus region is expected to be outside the marginally bound spherical orbit (MBSO) radius, and the innermost stable spherical orbit (ISSO) radius is expected to be in between the torus region. See [1].

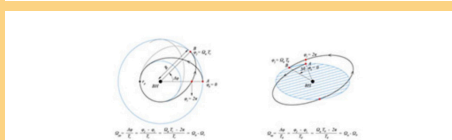


Figure 2: The figure represents the generalized relativistic precession phenomenon for QPOs near a black hole (BH) at the center, rotating anti-clockwise, where Ω_{ep} represents the periastron precession, and Ω_{rp} represents the nodal precession frequency. The initial point of the trajectory is indicated by point A, from where the particle follows an eccentric trajectory before completing one radial [left] or vertical oscillation [right] to reach point B. The particle sweeps an extra $\Delta\phi$ azimuthal angle during one radial [left] or vertical oscillation [right] since the accumulated motion is faster than the radial or vertical motion, causing the periastron or nodal precession. See [1].

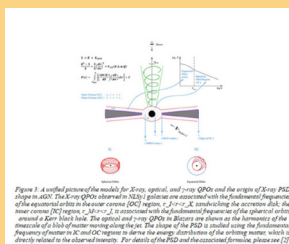


Figure 3: A unified picture of the models for X-ray, optical, and gamma QPOs and the origin of X-ray PSD shapes in BHs. The X-ray QPO observed in SMC X-1 is associated with the fundamental frequency of the eccentric orbits in the inner region (IC) region, Ω_{ep} , Ω_{rp} , and Ω_{ep} representing the periastron precession, the nodal precession, and the X-ray QPO frequency, respectively. The optical and gamma QPOs in Blazars are shown as the harmonics of the frequency of the X-ray QPOs. The shape of the PSD is related to the frequency of the X-ray QPOs, which is directly related to the black hole mass. For details of the PSD and the associated formulae, please see [2].

A geometric model can map plasma motion around rotating black holes to probe the origin of its light variations

Particles in an ionized state of matter called plasma zip around at the outskirts of black holes; they partly fall into the black hole, and the rest escape in the form of jets. Scientists have developed a model that can help probe the nature of plasma processes in black hole systems that could include powerful jets.

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► Dignitaries highlight need to democratise science & understand markets to reap benefits of science at INSA meeting

► IISF 2020 to focus on Science for Self-reliant India and Global Welfare

► Three centers based in Universities in Northeast & Kashmir to lead climate change research in Himalayan region

► Fluctuation in light curve in the jet of supermassive black holes may help explore emissions from them

► SwarnaJayanti Fellow working on quantum technological protocols for fast communication & secure encryption techniques

► Aerosols in Indo-Gangetic Plain enhanced high rainfall near the Himalayan foothills

► New anode material could produce efficient lithium-ion batteries for electric vehicles

► Young scientists share innovative ideas in a range of areas at the SCO Young Scientist Conclave

► Exploring Himalayan geological dynamics, natural hazards, climate variability, and natural resources

► Cancer may soon be treated with a new low-cost method using mitochondrial proteins called VDAC

► Technology can be an enabler for India to position itself as a global leader: PSA

► Scientists investigated how massive stars trigger formation of second-generation stars

► Magmatic intrusions could lead to prolific traps for hydrocarbon and geothermal energy resources

► Disturbance from North Atlantic that derails Indian monsoons needs to be factored to improve predictability

► Impact of climate on biodiversity in India & probable solutions discussed at international virtual conference

► 2020 Ramanujan Prize for Young Mathematicians awarded to Carolina Araujo

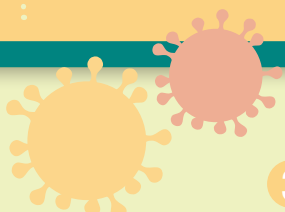
► Experts from India and Portugal deliberate on ways to use S&T ecosystems to face common health challenge

► DST-CII Tech Summit identifies possibilities of India & Portugal jointly scaling up solutions to address societal challenges

► Government, academia & industry representatives from India & Portugal discuss possible areas of tech collaboration

► DST-CII Tech summit deliberates on S&T collaboration opportunities between India & Portugal

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The major challenges that 2020 put before the world helped India emerge as a forerunner in underscoring the critical role of science and technology in bringing positive transformations for a safe secure, better society well prepared for the future.

The country pole-vaulted into one of the top nations in science technology indices and reached laudable positions in several domains of science technology and innovations.

20 Major Success Stories of DST 2020



India's ranking in publications, R&D & innovations has risen exponentially



The country is a key mover of global S&T efforts



Draft 5th Science, Technology, and Innovation Policy released for public consultation



S&T became core of decision making, claimed increased media space, gained public trust



DST's programmes triggered extraordinary performance of innovation ecosystem



A victorious march to combat COVID 19



Mathematical model predicts the rise and fall of the pandemic



Supercomputing power escalated, manufacture indigenized: National Supercomputer Mission



Centres with sophisticated analytical infrastructure established to provide state of the art facilities to researchers



New S&T areas of Cyberphysical systems like AI, Robotics, IOT receive big boost with research support & innovation hubs



Climate change research marked by impactful publications & centres of excellence in Himalayan Universities



Celebration of science invites attention of top dignitaries



Guidelines set up urging institutions of higher education and research to support diversity, inclusion and equity



Sri Chitra's proactive efforts help combat the pandemic



Survey of India launched Pan India High-Resolution Geospatial Mapping



SERB launches POWER for women researchers



Phenomenal white paper by TIFAC provided recommendations for Focused Interventions for 'Make in India after the COVID 19 pandemic



Scientists from IIA & ARIES collaborated with Nobel laureate on TMT



BSIP scales up COVID testing facilities, becoming the top institution throughout the country in terms of average processing time of samples



RRI achieves first successful implementation of a highly secure efficient Quantum Cryptographic scheme

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