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Daily News Feed

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Sabaijor Complex, Near Jamunajor Pul, Castair Town Deoghar, Mob:-9162500508

Why did Axiom-4 need 28 hours to reach the ISS?

Why did Axiom Space and NASA specifically use SpaceX's Dragon crew capsule for this mission?

Vasudevan Mukunth

The story so far:

On June 25, a crew capsule containing four astronauts, including India's Group Capt. Shubhanshu Shukla on his first spaceflight, lifted off atop a Falcon 9 rocket from NASA's spaceport in Florida. The lift-off marked the start of the Axiom-4 mission. By the time the rocket's two stages had completed their work, the crew capsule – called Dragon – was travelling at several thousand kilometres per hour. The capsule's destination was the International Space Station (ISS), which orbits the earth at roughly 400 km above sea level. At the time of lift-off, Axiom Space, which was orchestrating the mission, said Dragon would dock with the ISS in 28 hours.

Why did it need 28 hours?

It helps to picture the capsule and the ISS as two race-cars on separate lanes of the same track rather than as a car trying to drive straight up to a spot 400 km ahead. Everything happens sideways around the earth, and the choreography is dictated by orbital mechanics and strict safety rules.

To share the ISS's lane, the capsule needed to match both its altitude and its velocity vector. This was achieved using raw speed as well as timing. Going straight up 400 km would leave Dragon with virtually zero sideways speed, causing it to fall back almost immediately – like a ball that has been thrown up.

The Falcon 9 rocket vaulted Dragon into a low, slightly elliptical parking orbit about 200 km high. Its speed there was around 27,000 km/hr, which the capsule maintained just to avoid spiralling back down towards the ground.

The ISS is also higher than this parking orbit, at around 400 km, and therefore circles the earth a little more slowly to avoid spiralling down. While the ISS takes around 92 minutes to go around the earth once, Dragon started by taking around 88 minutes.

Thus, by being lower than the ISS, Dragon slowly fell behind in its orbit until it had caught up with the ISS.

After its system check-outs, the Dragon capsule performed a series of small thruster burns, also known as phasing burns, to first raise its apogee (the point of its elliptical orbit farthest from the earth) and then its whole orbit.

Each of these burns was timed such that after completing several orbits, Dragon ended up being exactly where the ISS would be. This was somewhat like merging into a highway at the right exit rather than steering straight towards another car.

What preparations were taken before docking?

For the Axiom-4 mission, the mission planners designed a pre-docking profile that lasted about 28 hours, or about 18 orbits.

At the end of this profile, the Dragon crew capsule was on the correct side of the ISS, where a free docking port was located, and at a time when the ISS crew was awake.

Once Dragon came within 30 km or so of the ISS, it moved itself into a 'corridor' aligned with the ISS. From here, the rules required the capsule to move at no more than a few metres per second. Once it was within 20 m of the ISS, Dragon was to slow to a few centimetres per second.

There are holding points at 400 m, 220 m, 20 m, and 1 m from the ISS, where the Dragon crew, including Group Capt. Shukla – who is the designated mission pilot – would have had to perform go/no-go polls and LIDAR checks. Even if there had been one wrong sensor reading in this process, Dragon would have been required to retreat from the ISS along a pre-programmed path.

This deliberate pacing alone added several hours to the crew capsule's approach towards the ISS.

The fact that Axiom Space and NASA used SpaceX's Dragon crew capsule for this mission is also relevant. It allowed the mission operators to opt for a more conservative, fuel-rich profile that also allowed the crew to finish check-outs, eat, and sleep before starting the intense docking exercise.

THE GIST

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Why is the ECI de-listing political parties?

What are the requirements for registering a political party with the Election Commission of India? What are the benefits enjoyed by Registered Unrecognised Political Parties? Does the Election Commission have explicit power to de-register a political party?

Rangarajan. R

The story so far:

The Election Commission of India (ECI) has initiated steps to de-list 345 Registered Unrecognised Political Parties (RUPPs) that have not contested elections in the last six years and whose offices could not be physically located.

What are registered parties?

The right to form an association is a fundamental right guaranteed under Article 19(1)(c) of the Constitution to all citizens. Political parties are an association or body of individuals that can be formed by citizens.

Section 29A of the Representation of the People Act, 1951 (RP Act) lays down the requirements for registration of a political party with the ECI. Any political party that seeks registration should submit a copy of its memorandum/constitution within 30 days of its formation. Such a document should contain a provision that the party shall bear true faith and allegiance to the Constitution of India. It should also bear allegiance to the principles of socialism, secularism and democracy, and uphold the sovereignty, unity and integrity of India. The ECI reviews the memorandum/constitution of the political party to verify that it contains provisions for internal democracy like periodic elections for its office bearers. The ECI thereafter registers them as a RUPP.

The RUPPs enjoy the following benefits – (a) tax exemption for donations received under Section 13A of the Income Tax Act, 1961, (b) a common symbol for contesting general elections to the Lok Sabha/State Assemblies, and (c) 20 'star campaigners' during election campaigns.

RUPPs are required to maintain the details of individual donors who have donated above ₹20,000 in a financial year and submit these details to the ECI every

Counting parties: Tribal women voters with their babies stand in queues to cast their votes during the fourth phase of the Lok Sabha polls, at Ulihatu in Khuti in May 2024. ANI

year. As per Section 29C of the RP Act, failure to furnish these details will result in losing income tax exemption. The RUPPs under the Income Tax Act, 1961, are further required to accept donations in excess of ₹2000 only through cheque or bank transfers.

What are the issues?

As per ECI notification, there are more than 2,800 RUPPs in India as of May 2025. However, only around 750 of them contested the 2024 general elections. It has resulted in the moniker – 'letter pad parties' – for the rest of the RUPPs. The RP Act does not confer explicit powers on the ECI to de-register any political party if it fails to contest elections, conduct inner-party elections or lodge requisite

returns. The Supreme Court in *Indian National Congress versus Institute of Social Welfare & Ors* (2002) had held that the ECI does not have the power to de-register any political party under the RP Act. It may de-register only under exceptional circumstances such as the registration being obtained by fraud or the political party ceasing to have allegiance to the Indian Constitution or if it is declared unlawful by the Government.

The ECI from time to time publishes the list of de-listed and inactive RUPPs. The notification of March 2024 (as amended till May 2025), contains the list of 281 de-listed and 217 inactive RUPPs. Parties have been de-listed after they were found to be 'non-existent' at their address even after notices from the ECI.

Political parties that have not updated the material changes including the list of office bearers since 2014 have been classified as 'inactive'. These parties are denied the benefit of putting up candidates with a common symbol in an election. Considering the provisions of the RP Act and the Income Tax Act, they would also become ineligible for tax exemptions.

What needs to be done?

The present exercise has identified 345 RUPPs that have not contested any elections since 2019 and could not be physically located anywhere. The ECI has directed the Chief Electoral Officer of various States and Union Territories to issue show-cause notices to these RUPPs before deciding on de-listing them. This is a welcome step that would prevent such 'letter pad parties' from misusing the income tax exemptions or committing any other financial fraud.

There are still likely to be more than 1000 'active' RUPPs that do not regularly contest elections. The Law Commission in its 255th report (2015) had recommended amendments for de-registration of a political party if it fails to contest elections for 10 consecutive years. The ECI in its memorandum for electoral reforms (2016) had also suggested amendment to the RP Act that would empower it to de-register a party. Apart from the exercise of de-listing RUPPs, these recommendations can also be implemented. Another serious issue plaguing almost all political parties is the lack of inner-party democracy. It may not be ideal for an independent constitutional authority like the ECI to be involved in the muddle of party politics. However, as suggested by the Law Commission in its 170th and 255th report, the RP Act can be suitably amended to contain specific provisions for ensuring internal democracy in political parties.

Rangarajan. R is a former IAS officer and author of 'Courseware on Polity Simplified'. He currently trains at Officers IAS Academy. Views expressed are personal.

THE GIST

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Revisit digital search powers under the I-T Bill 2025

Mahwash Fatima

is a Manager, Public Policy at TQH Consulting's technology practice in Delhi

The Finance Minister recently introduced a proposal in Parliament to allow tax authorities to access, under the Income-Tax Bill, 2025, an individual's "virtual digital space" during search and seizure operations. The justification is straightforward: as financial activity moves online, so must enforcement. However, this glosses over the far-reaching implications of such a shift, which raises significant concerns about privacy, overreach, and surveillance.

A blurring, open-ended

Currently, India's tax law already provides for search and seizure under Section 132 of the Income-Tax Act, 1961. But those powers are limited to physical space such as a house, office, and locker. Since such operations are based on suspicion of undisclosed income or assets, there is a connection between the objective, which is finding undisclosed income and getting access to physical assets.

The new Bill, however, blurs this link by including an individual's digital presence which is not only vast but often contains much more than what is relevant to a tax investigation. Without clear limits, such access can lead to disproportionate intrusion. For example, under the existing regime, what could be searched was what concerned only the individual under investigation. In contrast, digital spaces involve multiple stakeholders. Accessing a social media account also exposes friends, family, and professional contacts, through photographs and posts.

The proposed definition of 'virtual digital space' includes access to emails, personal cloud drives, social media accounts, digital application platforms, and more. Crucially, the phrase "any other space of similar nature" makes the list open-ended, potentially covering a wide range of digital platforms. Additionally, the proposed provision empowers tax authorities to override access codes to gain entry into electronic devices or virtual digital spaces. It still remains unclear

The proposal to access an individual's 'virtual digital space' raises significant concerns about privacy, overreach, and surveillance

though how this power will be operationalised in practice particularly in cases involving encrypted messaging apps such as WhatsApp, as explicitly cited by the Finance Minister in Parliament.

The problem becomes even more of a concern when the individual involved is a professional whose work requires confidentiality. For instance, journalists whose devices and emails hold sensitive information, including confidential sources, unpublished material, and protected communications. If a search is conducted on flimsy or overly broad grounds, it not only violates their privacy but also endangers their ability to undertake reporting. Recognising the risks, the Supreme Court of India, in 2023, circulated interim guidelines on the seizure of digital devices and directed the Union Government to contemplate formulating necessary protocols. Moreover, the judicial interpretation of "reason to believe" emphasises the need for tangible material beyond mere suspicion. Even under existing law, courts have construed that the provision ought to be exercised strictly, acknowledging that search and seizure is a serious invasion of privacy.

A violation of transparency, accountability

Yet, the proposed provision goes against these principles and is devoid of guardrails, judicial oversight, and has a lack of understanding of the stakes. It fails to acknowledge, let alone address, the sheer breadth and layered sensitivity of information stored on electronic devices. In line with the current law, the proposed provision prohibits disclosure of the "reason to believe" clearly violating principles of transparency and accountability.

Globally, privacy and transparency standards in search and seizure, especially where digital devices are involved, are grounded in statutory protections and procedural safeguards. In Canada, Section 8 of the Charter of Rights and Freedoms guarantees the right to be secure against "unreasonable search or seizure". It is designed to prevent unjustified searches and sets a three-part default standard: prior authorisation; approval by a neutral and impartial judicial authority; and reasonable and probable grounds. In the United States, the Taxpayer Bill of Rights, adopted by the Internal Revenue Service, affirms that taxpayers have the right to expect that any inquiry or enforcement action will be legally compliant and will not be more intrusive than necessary following due process rights, including search and seizure protections. The U.S. Supreme Court's decision in *Riley vs California* also necessitated a warrant before accessing digital data, given the deeply personal nature of information stored on phones and devices.

Contradiction of proportionality test

In contrast, India's proposed Income Tax provision grants sweeping access to digital personal data without warrants, relevance thresholds, or any distinction between financial and non-financial information. This directly contradicts the proportionality test upheld by the Supreme Court in *Justice K.S. Puttaswamy (Retd.) vs Union Of India*. The Court has held that any restriction to an individual's privacy must meet a four-fold test, of which proportionality was key, requiring state action to pursue a legitimate aim, satisfy necessity and adopt the least intrusive means available. Allowing unfettered access to personal digital data, in the absence of judicial oversight or safeguards, fails this standard.

The way forward is not to abandon digital enforcement altogether. Rather, it is to root it firmly in principles of proportionality, legality, and transparency. The right to privacy cannot and must not be eroded under the garb of regulatory action. Unchecked surveillance in the name of compliance is not governance but overreach. There is hope that the Select Committee which is currently reviewing the Bill narrows the definition of 'virtual digital space', and mandates prior judicial warrants and disclosure of reasons for such access to digital content in addition to establishing mechanisms of redress for aggrieved individuals.

Language of unity

Uniformity should not be confused with national unity in language policy

The National Education Policy (NEP) 2020 mandates that all students across the country must learn three languages in school. Theoretically, NEP 2020 is more flexible than the previous versions of the three-language policy in India, which have always faced resistance not just in south India but also different States. Hindi is only one of the many Indian languages, and States are free to choose any two Indian languages and one foreign language in the mix of three, according to NEP 2020. However, the fear that Hindi will become the default option as the second Indian language apart from the native language is aggravated by Maharashtra government's attempts to prioritise Hindi over other regional languages and its continuing vacillation on the issue. The State has now withdrawn its decision that Hindi will 'generally' be taught until Class five, as the second Indian language, after it kicked off a political storm in the State and put the ruling Bharatiya Janata Party (BJP) on the back foot. A committee headed by Dr. Narendra Jadhav will now deliberate with all stakeholders on the relevance of the three-language policy. Chief Minister Devendra Fadnavis has said the government would accept its recommendation. This change of heart comes after estranged cousins Uddhav Thackeray and Raj Thackeray, legatees of a strident version of Marathi pride that often turned into violent xenophobia, came together to oppose what they see as "imposition" of Hindi. Evidently, the language issue is uniting political rivals against the BJP.

Languages associated with power gain more influence but attempts to force languages on people on the back of political power can be divisive. The paradox is that the BJP sees the three language policy as a question of national pride and unity. It is clear that most students, including those in India's Hindi-speaking regions, want to learn English. According to Maharashtra Minister Ashish Shelar, nearly a fifth of students in the State are learning a third language and the new policy would give that option to all students. There are 15 languages including Hindi available in schools under the third language option, and when at least 20 students demand a language in a school, it will be taught. While this sounds noble and politically neutral, the actual implementation is different. Hardly anyone in Bihar has learnt Tamil or Malayalam or Kannada or Telugu under the three language policy so far. The chances of an overwhelming majority of students ending up with Hindi as part of the three-language policy is high. No State or school can offer a vast range of languages. The BJP must reassess its language policy taking into account the responses that are emerging from different parts of the country. It must learn the language of unity.

A year later — colonial-era laws to new criminal codes

R.K. Vij

is a former Indian
Police Service
(IPS) officer

It will be a year since the three criminal laws which replaced the British-era enacted laws came into effect. Last year, the central government replaced the Indian Penal Code with the Bharatiya Nyaya Sanhita (BNS), the Code of Criminal Procedure (CrPC) with the Bharatiya Nagarik Suraksha Sanhita (BNSS) and the Indian Evidence Act, 1872 with the Bharatiya Sakshya Adhiniyam (BSA). Policemen are gradually getting used to the new provisions. As most first information reports (FIRs) are registered through the Crime and Criminal Tracking Network and Systems (CCTNS), which is one of the pillars of the Inter-operable Criminal Justice System (ICJS), a smooth transition from the previous provisions of the laws to the new ones has been essential for the implementation of the new laws at the police station level. FIRs registered at zero are being routed to the police station of their jurisdiction through the CCTNS, albeit only within a State. The credit for this milestone goes to the Ministry of Home Affairs (MHA).

A significant development in policing has been the implementation of the 'e-Sakshya', which is a mobile application to collect and preserve evidence in real time. This app has been developed by the National Informatics Centre (NIC) in consultation with the MHA. The NIC is also the nodal agency for the implementation of the ICJS, which connects police (through the CCTNS) with the other pillars, namely, forensic science laboratories (FSLs), prosecution, jails and courts. While the transition to the new provisions of law is a mechanical exercise, it is the 'e-Sakshya' which is making a big difference on the ground. Feedback from the investigating officers (IOs) who are at the helm in implementing the new laws is important.

Mandatory recording of pictures and videos
The BNSS makes it mandatory for the IO to record certain processes using audio-video electronic means. Under some provisions, the use of such electronic means is optional. The 'e-Sakshya' app caters to six provisions of the law which include the recording of search and seizure through audio-video electronic means (a new provision under Section 105 of the BNSS), search by a police officer (under Section 185 of the BNSS), videography of the scene of crime (under Section 176 of the BNSS), recording of a statement (under Section 173 of the BNSS), recording of a statement (under Section 180 of the BNSS) and order of custody and disposal of property pending trial in some cases (under Section 497 of the BNSS).

Though the trial of the most heinous offences registered under the BNS is yet to be completed in order to review the overall impact of

Technological advancements have been useful, but feedback from the investigating officers, who have a pivotal role to play, is important

'e-Sakshya' on conviction, IOs are glad to be able to use it to capture pictures and videos on the spot, with geo-coordinates and a time stamp. For the public, this has enhanced visibility of the entire process of search and seizure. IOs are hopeful that witnesses (captured in photos and videos) cannot deny their presence at the scene of crime. Further, IOs cannot even (unofficially) depute their subordinates to carry out an investigation in their name. The provision of capturing a 'selfie' by the IO has been a deterrent and is likely to improve the overall quality of an investigation.

Similarly, the mandatory visit of an FSL expert to the scene of crime (Section 176 of the BNSS) is proving beneficial to the police. While the forensic infrastructure has not changed much in the last year, the IO now ensures that the scene of crime is mandatorily inspected by an FSL expert. There is also the use of a police dog at the scene of crime, which is useful in tracking suspects. The move to have a Central Forensic Science Laboratory (CFSL) and National Forensic Science University (NFSU) in Raipur, Chhattisgarh, which was announced by the Union Home Minister, Amit Shah, is a step that will help strengthen the forensic infrastructure.

The impediments
However, more still needs to be done. While pictures and videos captured using 'e-Sakshya' are stored in the National Government Cloud (NGC) through 'Sakshya lockers', courts are yet to start directly accessing such pictures and videos through the ICJS. Many IOs make a copy through the CCTNS (which is linked to the NGC) and submit a pen drive or a similar electronic device in court, along with the final report of the case. While the integrity of evidence is not questionable in this process, the duplication of work and unnecessary expenditure incurred in the procurement of pen-drives needs to be checked. Moreover, IOs use their personal mobile phones to capture pictures and videos. Those who did have an android phone have had to buy a new mobile because the 'e-Sakshya' can only be downloaded in mobile phones with Android version 10 and a minimum storage space of 1 GB. Some police stations have been given one tablet only, which is clearly not sufficient as each police station has more than one IO.

While each video could be of a duration of four minutes (maximum), there is no limit on the number of videos that can be taken. In case of a linked FIR, there is no provision to delete a picture or video that has not been recorded well. However, if an FIR is not linked, any picture or video can be deleted and recaptured. However, a maximum of five Sakshya IDs (SIDs) could be generated in the off-line (FIR not linked) mode. In

such cases, the pictures and the videos need to be uploaded whenever the IO reaches a network area in order to make space to capture additional pictures and videos with a fresh SID.

There are examples of accused persons being reluctant to be captured electronically when pointing out the spot where murder weapons have been hidden or when producing prohibited drugs. However, 'e-Sakshya' could prove to be a game-changing tool in improving investigations and ensuring convictions.

Though 'e-Sakshya' has a provision to automatically generate a hash value (using SHA256 function) and mandatory certificate (to authenticate the secondary electronic evidence), cyber-crimes which involve the seizure of electronic evidence need an expert who could offer a definite opinion and depose in a court of law. Therefore, State labs (including the one in Chhattisgarh) which are yet to be notified under the IT Act, need to get their cyber forensic laboratories soon.

While small thefts (of a value less than ₹5000) are not being registered as a cognisable offence under the ambiguous proviso to sub-section (1) of Section 303 of the BNS, petty organised offences under Section 112 of the BNS are registered (for some offences such as gambling) despite the definition being open ended and vague.

The new Section 530 of the BNSS provides for the recording of evidence and examination of witnesses (including an IO) through video conferencing, but such a practice has not yet become the norm. Similarly, while IOs seem satisfied with the implementation of the seven-day limit under Section 184 of the BNSS for forwarding the medical examination report of a rape survivor by a medical practitioner to the police, their major grievance of getting the post mortem report in time has not be resolved. The MedLEaPR (Medico Legal Examination and Post Mortem Reports System), which is a web-based application developed by the NIC Haryana is under testing in Chhattisgarh. This will enable the health department to create and forward medical examination reports and post-mortem reports more quickly to the police through CCTNS.

Need for feedback
Since all States and Union Territories are implementing the new laws, there is a need for feedback to review ease of implementation and carry out changes to minimise the practical problems that IOs face and also overcome the legal obstacles in courts. In addition, more resources need to be allocated for forensics and information and communication technologies. This will ensure that IOs do not have to use their personal gadgets for official processes and that each district has a separate mobile FSL unit.

Noble rot, the alchemist of wines, is setting fungal biology abuzz

In a startling discovery, researchers from Sichuan University and the University of British Columbia have found that *botrytis* fungi cannot be cloned. In these fungi, no single nucleus contains a complete set of chromosomes. Instead, the chromosome set is distributed across two or more nuclei, and any one nucleus contains only a subset

D.P. Kasbekar

A grape vineyard in Moldova, 2017. Botrytis fungi infects grapes with the effect of concentrating the sugars and flavours in them. USAID

In wine-making circles, "noble rot" is an exalted name for the botrytis fungus (*Botrytis cinerea*). It infects grapes, penetrates the skin, causes the berries to lose water by evaporation and shrivel up, and thus concentrates the sugars and flavours in them. Since only a small percentage of grapes in a vineyard are infected, they must be picked by hand.

This makes the picking process labour-intensive and drives up the cost. The crushed grape juice from rotted grapes is used to make high-quality sweet wines like the Sauternes of Bordeaux, the Trockenbeerenauslese of Germany and Austria, and the Tokaji Aszús of Hungary. They are also very expensive.

Befitting its exalted status, the botrytis fungus was also found recently to exhibit an unusual idiosyncrasy. In all animals, plants, and fungi, the nucleus of a cell contains one or more sets of all of the chromosomes of the organism. This property of nuclei allows us to clone animals. Scientists can transfer such a nucleus, which contains all the DNA instructions, into an egg cell whose own nucleus has been removed and, in the right conditions, prompt it to develop into a new organism.

But because of the idiosyncrasy, botrytis fungus cannot be cloned – nor can another fungus called *Sclerotinia sclerotiorum*.

A team of researchers from Sichuan University in China and the University of British Columbia in Canada have made a startling discovery: in these fungi, no single nucleus contains a complete set of chromosomes. Instead, the chromosome set is distributed across two or more nuclei, and any one nucleus contains only a subset.

These unexpected findings were reported in *Science*.

Ascomycetes, asci, ascospores

Botrytis and *Sclerotinia* are ascomycetes fungi. The first cell of a baby fungus born following a mating between two ascomycetes fungi is called the ascospore. All the subsequent other cells of the individual are derived from it. This is the defining feature of ascomycetes fungi. The ascospores are produced in a sac-like cell called the ascus (plural asci). An ascus, produced when two parental strains mate, contains two complete sets of chromosomes.

In many well-studied ascomycetes fungi, eight ascospores are made in each ascus. All the nuclei of an individual ascospore are genetically identical. That is, they all have the same set of chromosomes. *B. cinerea* and *S. sclerotiorum* also make asci with eight spores. The researchers had no reason to suspect them to be any different.

How are discoveries made?

People are often curious to know how scientists make their discoveries. Most discoveries originate in experiments that did not work in the way they were meant to. Sadly, the converse is not true.

The most common explanation for experiments that don't work the way were meant to is some kind of "operator error" – i.e. a silly mistake of some kind: a growth medium was not properly made, the incubator was not set to the right temperature, the wrong strain was used, etc. Silly mistakes are more common than serendipitous leads.

Not surprisingly, scientists get mad with experiments that don't work. But once in a while, this type of experiment is a harbinger of an unexpected discovery. This is the scientist's dilemma.

Improbable versus true

The research team set out to obtain mutants of *S. sclerotiorum*. For this they exposed the ascospores to ultraviolet light. Each *S. sclerotiorum* ascospore contains two nuclei. Both nuclei were assumed to carry the same set of chromosomes. UV-induced mutations occur at random. Therefore, it was highly unlikely the same gene would become inactivated in both nuclei of an ascospore.

Consequently, a colony containing mutant cells was also expected to include a sector with non-mutant cells. The

Botrytis cinerea also called **noble rot infects grapes, penetrates the skin, causes the berries to lose water by evaporation and shrivel up, and thus concentrates the sugars and flavours in them**

non-mutant cells would have nuclei descended from the ascospore nucleus with the non-mutant gene.

But in the experiment, of the more than 100 mutant colonies the researchers examined, all contained only mutant cells. None of them had a non-mutant sector. This was most unexpected. Why weren't any non-mutant cells seen in these colonies?

This observation set the researchers up for their Sherlock Holmes moment: "When you have eliminated all which is impossible, then whatever remains, however improbable, must be the truth."

Could the two nuclei between them contain only one set of chromosomes?

Closer examination

The researchers wrote in their paper: "Because this prediction challenges established principles of chromosome biology, we conducted a closer examination of the ascospores' nuclei and chromosomes."

They used molecular probes that bind specifically to individual chromosomes, allowing them to say whether or not a nucleus contains the chromosome. When the probes were used individually, they lit up exclusively one nucleus per ascospore. The probe never lit up both nuclei.

This meant the two nuclei harboured distinct chromosome sets. When both probes were used together, in some ascospores the signals showed up in only one nucleus and in other ascospores the signals were seen in both nuclei. This meant the distribution of chromosomes in the nuclei differed between ascospores.

Further tests revealed that each nucleus of a *S. sclerotiorum* or *B. cinerea* ascospore contained only three to eight chromosomes.

New questions

The findings have already spawned many questions in the research community. What is the mechanism by which chromosomes are allocated to the different nuclei? How is genetic integrity preserved during cell division? What restores a complete set of chromosomes when the fungus mates, and with its mating partner forms new asci? Which genes and mechanisms are involved in chromosome sorting and regulation? What advantage does chromosome distribution confer to *Botrytis* and *Sclerotinia*?

The questions have generated a new buzz in fungal biology. Right now, scientists doing research with fruit flies, nematodes, zebrafish, mice, and other model organisms might be envying those working with rot fungi – noble or otherwise.

(D.P. Kasbekar is a retired scientist. kasbekardp@yahoo.co.in)

THE GIST

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Botrytis and *Sclerotinia* are ascomycetes fungi. The first cell of a baby fungus born following a mating between ascomycetes is called an ascospore. These are produced in a cell called the ascus, which contains two sets of chromosomes

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At ISS, Shukla takes up experiment on skeletal muscle degradation in space

The Hindu Bureau
BENGALURU

Group Captain Shubhan-shu Shukla, who is aboard the International Space Station (ISS), has commenced research activities at the orbiting laboratory.

According to Axiom Space, the crew members are fully immersed in their mission having transitioned smoothly from arrival protocols to hands-on research.

Axiom Space said Shux (Group Captain Shukla's mission call sign) spent time in the Life Sciences Glovebox (LSG) working on the Myogenesis experiment.

"This study aims to uncover the biological pathways behind skeletal muscle degradation in space – a major challenge for astronauts. By identifying these mechanisms, researchers hope to develop targeted

Lab work: Shubhanshu Shukla spent time in the Life Sciences Glovebox working on Myogenesis experiment, says Axiom Space. ANI

therapies that could not only protect space travelers but also aid people suffering from muscle–degenerative diseases on Earth," Axion Space said.

The ISRO has shortlisted seven microgravity experiments which Mr. Shukla would be conducting during his 14-day stay at the ISS. Myogenesis has been proposed by the Bengalu-ru-based Institute of Stem Cell Science and Regenera-

tive Medicine (InStem).

The ISRO has said that the experience gained through the seven experiments is expected to nurture a microgravity research ecosystem in India, resulting in the induction of advanced microgravity experiments in various disciplines in the Indian space programme.

The ISRO and NASA will also participate in five joint science investigations and

two in-orbit STEM (science, technology, engineering, and mathematics) demonstrations.

Axiom said the crew initiated the Cerebral Hemodynamics study, completing the first session after installing the necessary software. "Using ultrasound technology, this research explores how blood circulates in the brain under microgravity conditions. The findings could improve our understanding of cardiovascular adaptation in space and inform medical diagnostics and treatments for conditions like stroke and hypertension on Earth," it said.

The Axiom-4 mission research complement includes around 60 scientific studies and activities representing 31 countries, including the U.S., India, Poland, Hungary, Saudi Arabia, Brazil, Nigeria, the UAE, and Europe.

People had won against Emergency, says Modi

Those who imposed the measure had also intended to enslave the judiciary, says PM in his *Mann Ki Baat* address; he highlights wider reach of government schemes, women-led development

The Hindu Bureau
NEW DELHI

Prime Minister Narendra Modi on Sunday said those who had imposed Emergency not only murdered the Constitution but also intended to enslave the judiciary.

During his *Mann Ki Baat* address, the audio clips of former Prime Ministers Morarji Desai and Atal Bihari Vajpayee, and former Deputy Prime Minister Babu Jagjivan Ram, speaking on the Emergency, were played.

About Morarji Desai's remarks, Mr. Modi said: "You can imagine what that period was like! Those who imposed Emergency not only murdered our Constitution, but also had the intention to keep the judiciary as their slave. During this period, people were tormented on a large scale... [former Defence Minister] George Fernandes was tied with chains," he said.

However, people did not accept any "compromise with democracy". "Finally, the people at large won –

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>
> **NARENDRA MODI**
> Prime Minister
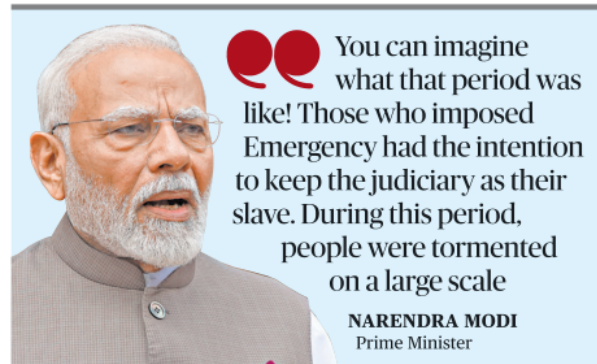
the Emergency was lifted and those who imposed the Emergency were defeated," he said.

The Emergency was imposed by the Congress government under then Prime Minister Indira Gandhi on June 25, 1975. A clip of Vajpayee calling the defeat of the government in the 1977 election a "peaceful revolution" by voters was played.

Noting that India had now become a trachoma-free country, the Prime Minister said the achievement was recognised by the World Health Organization.

Quoting an International Labour Organization report, Mr. Modi said over 64% of the population (about 95 crore) was getting the benefit of at least one social security scheme, while till 2015, government schemes reached less than 25 crore. Mr. Modi also spoke about the "International Yoga Day" events organised in different parts of the country and overseas.

On pilgrimages, he stated that they were means of disciplining the body and purifying the mind, mutual love and brotherhood, and connecting with God.

"After a long time, the Kailash Mansarovar Yatra has had an auspicious restart... Kailash is considered the centre of faith and devotion in every tradition, be it Hindu, Buddhist or Jain," he said.

On the progress made in the Bodo Territorial Area of Assam, Mr. Modi said the Bodoland CEM Cup was being organised as a celebration of unity and hope.

Among the participants were about 70,000 players, including a large number of girls.

Referring to the diversity of arts, crafts, and skills in the country, he cited the example of Eri Silk of Meghalaya, calling it "a perfect product for the global market" which got the Geographical Indication (GI) tag recently.

He spoke about women-led development, quoting the example of Bhadrachalam of Telangana, where women earlier working as labourers were now making biscuits from millets.

"At this moment, everyone's eyes are also on the International Space Station. India has scripted new history. Yesterday I also spoke to Group Captain Shubhanshu Shukla," he said, adding that on July 1, two key pillars of society – doctors and chartered accountants – would be honoured.

Kerala to seek sterilisation of bonnet macaque near forests

K.S. Sudhi
KOCHI

Kerala is likely to undertake mass sterilisation of the bonnet macaque as part of measures to control the population of the widely seen primate species.

The Kerala Forest Department will shortly approach the Union Ministry of Environment, Forests, and Climate Change seeking permission to carry out sterilisation of the species endemic to South India.

Farmers and people living in forest fringes have complained about crop loss caused by the troops of monkeys. The animals, according to farmers, damage a wide variety of crops, including coconuts and other agricultural produce.

The bonnet macaque is

Bonnet macaques have been blamed for crop loss. FILE PHOTO

the second species for which population-control measures are being proposed in the State after wild pigs. Though wild pigs are being culled, there are no plans to cull monkeys.

The Forest Department had drawn up a "Mission Bonnet macaque" as part of a 10-point programme to reduce instances of human-wildlife conflicts. The sterilisation programme, along with other initiatives, is part of the mission, said Pramod G. Krishnan, Chief Wildlife Warden (CWW), Kerala.

The proposal is to sterilise the troops and release them back into their territories after monitoring their health. The project requires the permission of the Union Ministry since the species is included in Schedule I of the Wildlife Protection Act. The International Union for Conservation of Nature has included the monkeys in the "vulnerable" category considering its declining population.

The department plans to implement waste management programmes in eco-tourism centres where these animals feed on leftover food.

Ahead of Census, States asked to lock boundary changes before Dec. 31

Vijaita Singh
NEW DELHI

The Registrar-General of India (RGI) has informed the States that the first phase of the Population Census 2027 – House Listing and Housing Schedule (HLO) – will tentatively begin on April 1, 2026 and preparations need to be made accordingly.

The RGI has also informed the States that the administrative boundaries will be frozen by December 31 and if any changes are to be made to the limits of police stations, tehsils, and districts, it should be done before the said date.

A senior government official told *The Hindu* that the dates and questions to be asked in the first phase

Last call

Around 24 lakh enumeration blocks finalised for the 2021 Census are likely to be used for the 2027 count

- The Census can be conducted only three months after the freezing of boundary limits of administrative units

- Houselisting Operation to begin on April 1, 2026, while the population count is set to begin on February 1, 2027

- Any changes in the existing boundaries must be intimated by December 31, 2025

- Boundaries of administrative units are not changed once enumeration blocks are finalised

will be notified in the Gazette later. Nearly 34 lakh enumerators and supervisors, mainly officials working with the State governments, and 1.3 lakh Census functionaries are expected to be deployed for the exercise, which will be done digitally for the first time.

Around 24 lakh enumeration blocks (EB) finalised for the 2021 Census are likely to be used for the 2027 Census.

Each EB usually comprises 150-180 houses or 650-800 people.

The exercise covers all States phase-wise and usually follows the April-September period, when the enumerator assigns a distinct number to each house, building or public space.

For Census 2021, which could not take off initially due to the COVID-19 pandemic and will now be known as Population Census-2027, the notification published on January 9, 2020 said that the first phase will begin on April 1, 2020 and end on September 30 the same year. For the 2021 Census, the Centre had notified 31 questions for the first phase related to household details.