

Polity/Bodies (1)

• 28 place names standardised in Ladakh — Survey of India and the MHA process

Body: 2 October 2026: the **Ministry of Home Affairs** announced that the Government of India, in consultation with the **UT of Ladakh**, identified **28 places/features** by **standard place and feature names on the official Survey of India map**. Stated aim: accurate recognition and public awareness.

Feature types used: **Peak, Mountain, Pass, Glacier, Valley, Lake, River, Water body, Land area.**

Buddhist-transmission names: **Atisha Giri** (Ati■a D■pa■kara), **Rinchen Zangpo** (the Great Translator of Guge), **Marpa Lotsava Ri** (*lotsava* = translator; Marpa taught Milarepa), **Milarepa Kangri, Guru Rinpoche** (Padmasambhava; a lake), **Kumarayana Point** (father of Kum■raj■va), **Sakyasri Giri**.

Indian historical names: **Kanishka Peak** (Kushan emperor), **Martand Giri** (Martanda, the sun), **Zorawar Peak** (**Zorawar Singh**, Dogra general who campaigned into Ladakh and Baltistan in the 1830s-40s), **Shiva Ri**.

Formalised local toponyms: Brangsa, Kuksel, Parpik, **Skamri Glacier**, Shachmirk Pass, Shkorga Valley, Panglung, Shamal Lungpa, Yangpa River, Drak Karpo, Jolmori, **Dehra Compass, Gogra, Hot Spring**. **Gogra** and **Hot Spring** were among the friction points of the **2020-21 eastern Ladakh standoff** and subsequent disengagement.

Survey of India: founded **1767**; India's **oldest scientific department**; national survey and mapping organisation; under the **Department of Science and Technology**.

Great Trigonometrical Survey begun **1802** — measured the subcontinent by **triangulation**; computed the height of **Peak XV**, later named **Everest** after Surveyor General **Sir George Everest**.

Standard place names on official maps are the Survey of India's responsibility; additions are made by Government, here the **MHA** with the **UT administration**.

Distinguish: **renaming** an already-named place, versus **identifying** features that carried no standard name — this exercise is largely the latter.

Exam hook: **Context:** China has periodically issued its own name lists for features in **Arunachal Pradesh**, which India has rejected as having no effect on Indian territory. Official cartography is an exercise of sovereign authority.

Defence (4)

• Naval Commanders' Conference 2026/02 and Operation Urja Suraksha

Body: **Commanders' Conference 2026/02:** Nausena Bhawan, New Delhi, 29 September to 1 October 2026. The Navy's apex-level forum, held twice a year.

Attended by the **CNS**, the **Commanders-in-Chief** and outstation **Operational and Area Commanders**. The **Raksha Mantri** opens it; the **CDS** and **COAS** engage on tri-service synergy.

Review is at the **military-strategic level** — above the operational level, below grand strategy.

Operation Urja Suraksha: launched **25 March 2026**, escorting Indian-flagged crude, LNG and LPG carriers through the **Strait of Hormuz**.

Over 5 frontline warships deployed, including **INS Surat (D69)**, across the **Gulf of Oman** and **Persian Gulf**. Provides **escort plus route-specific navigational guidance**.

At the peak, **36-38** vessels and about **1,100** Indian sailors were affected; some **20-22** Indian-flagged ships remained in the western Strait in late March.

The **Strait of Hormuz** carries roughly **one-fifth** of the world's traded oil and about **60%** of India's oil and gas imports.

Lineage: **Gulf of Aden anti-piracy escort since 2008** → **Operation Sankalp, June 2019** (after Gulf of Oman tanker attacks) → **Operation Urja Suraksha, 2026**.

Sustainment rule of thumb: roughly **3 hulls** in the cycle for **1** continuously on station.

Exam hook: **JAI pillars:** **Jointness, Aatmanirbharta, Innovation**. Technology focus: **AI, Big Data Analysis, autonomous/uncrewed systems, cyber operations**.

• Second India-Fiji Bilateral Joint Working Group on defence

Body: **2nd India-Fiji Bilateral Joint Working Group** on defence: New Delhi, 28 September 2026.

Co-chairs: **Shri Amitabh Prasad**, Joint Secretary (International Cooperation), Ministry of Defence, and **Mr Mason Smith**, Permanent Secretary for Defence and Veterans Affairs, Fiji. Defence Secretary: **Shri Rajesh Kumar Singh**.

Agenda: **military training and capacity building, service-to-service engagements, maritime security, cyber training, defence industry collaboration**.

Fijian delegation visited **Southern Naval Command, Kochi**, on **29-30 September 2026** — the Navy's **training command** — for advanced naval and professional aviation training modules. Also visited **DPSU Bhavan** and the **National War Memorial**.

Girmit = local pronunciation of "**agreement**"; indentured migrants were **girmitiya**. First ship **Leonidas**, **464** migrants, **May 1879**. About **60,553** Indians migrated **1879-1916**; indenture abolished **1920**. Indo-Fijians are about **37%** of Fiji's population.

RFMF — Republic of Fiji Military Forces. UN peacekeeping since

UNIFIL, Lebanon, 1978. Over **330** personnel across **7** UN operations; **UNAMI** commitment concluded **December 2025**; continues with the **MFO** in the **Sinai**.

FIPIIC launched **November 2014**. Summits: **Suva 2014, Jaipur 2015, Port Moresby 22 May 2023. 14 Pacific Island Countries**.

The 14 PICs: **Cook Islands, Fiji, Kiribati, Marshall Islands, Micronesia, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu**.

Exam hook: India's formula: a **free, open, inclusive and secure** Indo-Pacific — "**inclusive**" is the distinctively Indian addition.

• Operation Drishti — AFMS mega eye surgical camps in Kashmir

Body: **11th Mega Eye Surgical Camp** under **Operation Drishti** concluded at **92 Base Hospital, Srinagar**, on **30 September 2026**, closing the **Kashmir leg**.

364 eye surgeries across both camps — cataract, glaucoma, pterygium and retinal procedures. Surgical team from **Army Hospital (Research & Referral)**, led by **Brigadier Sanjay Kumar Mishra**.

Screening: teams from **92 Base Hospital** and **328 Field Hospital** ran **18 screening camps** at **Tangdhar, Dawar, Machil, Uri, Baramulla, Bandipora, Khanabal and Kangan**; nearly **6,000** screened, about **500** identified as needing surgery.

Phase 1 — **Tangdhar, 24-25 September 2026**, in the sector along the **Line of Control**: the **first-ever mega eye surgical camp at the LoC, in an underground operation theatre**. **220** surgeries in two days.

Phase 2 — **92 Base Hospital, Srinagar, 28-29 September 2026: 144** surgeries, including **glued IOL implantation, glaucoma surgery, pterygium excision** and **retinal interventions for diabetic retinopathy**. **LG of J&K Shri Manoj Sinha** attended the closing; **Lt Gen Balbir Singh, GOC 15 Corps**, present.

Cataract: clouding of the **lens**; leading cause of blindness in India; **reversible** — lens removed and an **intraocular lens (IOL)** implanted. A **glued IOL** is fixed to the **sclera** where capsular support is inadequate. **Glaucoma:** damage to the **optic nerve**, usually with raised intraocular pressure; vision lost is **not recoverable** — treatment arrests progression. **Pterygium:** benign fibrovascular growth of the **conjunctiva** over the **cornea**; linked to **UV light, wind and dust**; common in outdoor and high-altitude populations.

Diabetic retinopathy: damage to retinal blood vessels from diabetes; interventions arrest rather than reverse damage.

Operation Drishti has covered the **North, West, East and Central** regions; next phase in **Odisha**.

Exam hook: **AFMS = Armed Forces Medical Services**. Note the distinction between **restoring** sight (cataract) and **preserving** it (glaucoma, retinopathy) — the reason screening matters as much as surgery.

• HQ Integrated Defence Staff Silver Jubilee — Tri-Service Day and the road to the CDS

Body: HQ Integrated Defence Staff established 1 October 2001, New Delhi. The date is observed as Tri-Service Day. Silver Jubilee 1 October 2026, theme "Future readiness through jointness & Integration", event "Trishakti Manthan".

Kargil Review Committee constituted 29 July 1999, chaired by K. Subrahmanyam.

A **Group of Ministers** in 2001 recommended structural reform. Three outcomes: HQ IDS, the **Defence Intelligence Agency**, and the CDS post — the last **not** acted on at the time.

For 18 years HQ IDS was headed by the **Chief of Integrated Defence Staff to the Chairman, Chiefs of Staff Committee (CISC)**, the COSC being chaired by the senior-most service chief **by rotation as an additional duty**.

CDS timeline: announced by the PM on 15 August 2019; approved by the **Cabinet Committee on Security** on 24 December 2019; **General Bipin Rawat** appointed first CDS on 31 December 2019.

A **Department of Military Affairs** was created in the Ministry of Defence, with the CDS as its **Secretary**.

Current CDS and Secretary DMA: General N.S. Raja Subramani.

Current CISC: Air Marshal Tejinder Singh.

Jointness = planning and employing **land, maritime, air, space, cyber and cognitive** capability as a single instrument — not merely cooperation.

HQ IDS outputs: joint operational doctrines, joint training frameworks, integrated exercises, coordinated **HADR** mechanisms; leadership on **cyber, space and AI**.

Institutional platforms: Ran Samwad, **Joint Commanders' Conference (JCC)**, **Combined Operational Review and Evaluation (CORE) Programme**.

India's two tri-service commands: **Andaman and Nicobar Command** (the only tri-service **geographic** command) and **Strategic Forces Command** (nuclear).

Theatre commands remain unimplemented. The Air Force's principal objection is that air power's advantage lies in being **centrally held and concentrated at short notice**.

Exam hook: Silver Jubilee featured a commemorative book and film, **CDS Unit Citations**, and a wreath-laying at the **National War Memorial and Museum**.

• River rejuvenation through the watershed approach — DoLR pilot projects

Body: **National Workshop** on pilot projects for **River Rejuvenation through the Watershed Approach**, **Department of Land Resources**, New Delhi, 29 September 2026.

Secretary, DoLR: Shri Narendra Bhooshan. **Joint Secretary (Watershed Management):** Shri Nitin Khade. **CEO, NRAA:** Dr Chandra Shekhar Kumar.

Watershed / catchment / drainage basin — the area draining to a common outlet, bounded by a **water divide**.

Base flow — streamflow sustained by **groundwater discharge** between rain events; it is what makes a river perennial.

A river that has become seasonal has usually lost its **base flow**, not its rainfall. If groundwater falls below the stream bed, the aquifer stops feeding the river and may begin to drain it.

Ridge-to-valley sequencing: contour bunding and trenching on slopes → gully plugs and check dams on drainage lines → percolation tanks and farm ponds → afforestation and pasture development.

The common mechanism: **slow the water down so it has time to infiltrate**.

Caveat: watershed treatment **redistributes** water, it does not create it.

Upstream storage can reduce downstream inflow, and recovered groundwater often raises crop water use, increasing **irrecoverable evaporative loss**.

Stream order (Strahler): a headwater stream with no tributaries is **first order**; two streams of equal order joining raise the order by one; a lower-order stream joining a higher-order one **does not** change the order. Pilots target **first-, second- and third-order streams** — the most numerous, and the most responsive to catchment treatment.

Selection parameters: historical decline in flow, catchment condition, rainfall, groundwater depletion, intervention potential, data availability.

Institutions involved: NRSC, Central Ground Water Board, NMCG, NRCD, Indian Institute of Remote Sensing, National Institute of Hydrology, National Geophysical Research Institute, ICAR, IITs.

Convergence with **VB-G RAM G, CAMPA**, Ministry of Jal Shakti, state schemes and CSR — a **Whole of Government and Whole of Society** approach.

Exam hook: Monitoring across 4 dimensions: hydrological, environmental, agricultural, socio-economic.

Environment (2)

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• Two Great Indian Bustards released into the wild at Sam, and the jumpstart method

Body: **Event: 4 October 2026** — Union Environment Minister **Bhupender Yadav** released 2 **male Great Indian Bustards** into the wild at **Sam, Desert National Park**, Jaisalmer, Rajasthan.

Significance: the programme's transition from **conservation breeding to rewilding and augmentation**; learnings to refine protocols for later releases.

Bustard Recovery Programme: MoEFCC + Rajasthan Forest Department + Wildlife Institute of India (WII); technical collaboration with the **International Fund for Houbara Conservation**; funded by **National CAMPA**. Components — conservation breeding, habitat management, threat mitigation, habitat restoration, community engagement.

Captive stock: 97 birds at **Sam** and **Ramdevra** — 40 from wild-laid eggs, 57 captive-bred. 86 for captive reproduction, 11 earmarked for release, 2 released. Chicks — 24 in 2025, 29 in 2026. The population stood at 94 earlier in 2026.

'Jumpstart' approach: captive-laid eggs placed in **wild nests** and accepted by incubating wild females — 6 chicks in **Rajasthan**, 2 in **Gujarat**. The chick is raised by a wild mother and never becomes a captive bird; it attacks the species' **single-egg clutch** constraint directly.

Why males, why only 2: a one-egg clutch makes **females** the limiting resource, so an untested protocol is tested on the sex whose loss costs the population least; and 2 of 11 is how a never-executed release protocol is validated.

Habitat works: about 200 sq km of **fenced grassland enclosures** inside the Desert National Park; WII **telemetry** identifies these as prime breeding habitat. Fencing excludes subsidised predators and controls grazing.

Species: **Ardeotis nigriceps**. Close to 1 m tall, males to 15 kg — among the heaviest flying birds. **IUCN Critically Endangered; Schedule I**, Wild Life (Protection) Act, 1972; **state bird of Rajasthan**. Dispersed male display with a gular pouch; **single egg** on bare ground. Wild population **fewer than 150**, overwhelmingly in Rajasthan.

Chief threat: power-line collision — heavy body, **narrow frontal vision**, poor manoeuvrability. The Thar is simultaneously India's best solar and wind resource and the bird's last habitat.

M.K. Ranjitsinh v. Union of India: 19 April 2021 — overhead lines restricted across about 99,000 sq km of priority and potential habitat; **bird diverters** directed on existing lines. **21 March 2024** — three-judge bench recalibrated the blanket undergrounding direction and constituted a **7-member expert committee**; about 80 km prioritised for immediate undergrounding, about 250 km identified by WII for burial within 2 years.

Constitutional significance: the 2024 judgment recognised a **right against the adverse effects of climate change** under **Articles 14 and 21**.

Exam hook: Contrast: Sariska moved **wild-born** tigers between wild populations. Releasing **captive-bred** animals is a harder problem, because wild behaviour and landscape knowledge are learned, not instinctive.

• DGCA training syllabus for gyroplane pilot licences; autorotation explained

Body: **DGCA CAR, Section 7, Series B, Part XXI** — *Ground and Flying Training Syllabus for Issue of Pilot Licence for Gyroplanes*, promulgated **29 September 2026**.

Stated as an **initial step** towards introducing gyroplanes in India; training organisations and manufacturing to follow.

Gyroplane: propeller provides thrust; a freely rotating, unpowered rotor provides lift.

Airflow is upward through the rotor disc — the opposite of a powered helicopter, which drives air **downward**.

Autorotation: the rotor derives **100%** of the power to turn it from the freestream.

No anti-torque tail rotor needed — the engine drives the propeller, not the rotor, so there is **no torque reaction** on the fuselage.

Cannot hover and **cannot take off vertically** in normal operation; needs forward motion through the air.

Pre-rotator: a clutch letting the engine spin the rotor up before take-off, shortening the ground roll. A **jump take-off** uses stored rotor energy and needs a specially designed machine.

Cannot stall in the fixed-wing sense — slowing down steepens the descent, which increases upward flow and sustains rotation.

First documented autogiro flight: the C.4, 17 January 1923, pilot **Alejandro Gomez Spencer**, Cuatro Vientos near Madrid. Inventor **Juan de la Cierva** (Spain).

Dissymmetry of lift: in forward flight the **advancing blade** sees rotational speed **plus** forward speed and the **retreating blade** sees rotational speed **minus** forward speed, producing unequal lift and a rolling moment.

Flapping hinge: Cierva's solution — the advancing blade flaps up (reducing angle of attack and lift) and the retreating blade flaps down (increasing it), equalising the rotor automatically. It is the ancestor of the **articulated helicopter rotor head**.

Uses: joyrides, air experience flights, and aerial work — **agricultural spraying, banner towing, surveillance, survey**.

Exam hook: Power pushover — abrupt rotor unloading with propeller thrust still acting — is the characteristic gyroplane handling hazard.

• CHIME's standalone 21-cm hydrogen detection and dark energy

Body: **CHIME = Canadian Hydrogen Intensity Mapping Experiment**, at the **Dominion Radio Astrophysical Observatory**, Penticton, **British Columbia**, Canada.

First standalone detection of the cosmological 21-cm hydrogen signal — previously only via **cross-correlation** with galaxy surveys. Published in **The Astrophysical Journal**.

Indian participation: **Raman Research Institute (RRI)**, an autonomous institute of the **Department of Science and Technology**. **Dr Saurabh Singh** (RRI); **Dr Arnab Chakraborty** (Toronto); **Dr Mark Halpern** (UBC, PI); **Dr Shabbir Shaikh** (Arizona State).

21-cm line: a **hyperfine** (spin-flip) transition of **neutral hydrogen**; wavelength about 21 cm, rest frequency about 1420 MHz; a **forbidden** transition with a mean lifetime of order 10 million years per atom — detectable only because hydrogen is so abundant.

Redshift: expansion stretches wavelength, so a **lower observed frequency means higher redshift and an earlier epoch**.

CHIME observes 400-800 MHz → redshifts $z \approx 0.8$ to 2.5 → universe about 2.5 to 7 billion years old. The reported signal is from about **five billion years**.

Design: four cylindrical parabolic reflectors, 20 m × 100 m, each with 256 dual-polarisation cloverleaf antennas — 1,024 total. **No moving parts;** a **transit / drift-scan** instrument relying on Earth's rotation. Uses **interferometry**.

Intensity mapping: measures the **combined** 21-cm brightness of a sky patch rather than resolving individual galaxies — far larger volume, far lower cost, and measures all the hydrogen rather than only bright galaxies.

Science target: baryon acoustic oscillations (BAO) as a **standard ruler** to trace the **expansion history**, and thereby probe **dark energy**.

Data: 94 nights from 2019; nearly 7 years of data available; next target the universe at about **3 billion years**.

About 2% of the universe's hydrogen was neutral atomic at the observed epoch — confirming this is a **post-reionisation** measurement.

Sequence to remember: Big Bang → **recombination** (about 380,000 years, releases the **CMB**) → dark ages → first stars → **reionisation** (largely complete within the first **billion years**) → neutral hydrogen survives mainly **inside galaxies**.

Exam hook: The release's headline "earliest glow of hydrogen" is **misleading** — five billion years is well after reionisation.

Sci/Tech (6)

• First offshore mineral block auction in the Andaman Sea — polymetallic nodules

Body: 1 October 2026: Ministry of Mines launched the auction of two offshore mineral blocks in the Andaman Sea for a Composite Licence. Secretary **Shri Keshav Chandra**; JS and Administering Authority **Shri Kadam Sandeep Vasant**.

Blocks: **Sewell Rise-01** (southern part of Sewell Rise) and **West Sewell Ridge-01** (off **Great Nicobar Island**). Combined area **over 1,632 sq km**. **Minerals:** **polymetallic nodules and crusts**, hosting **cobalt, nickel, manganese, copper and rare earth elements**.

Polymetallic nodules: potato-shaped concretions on the **abyssal plain**, formed by **hydrogenetic precipitation** of manganese and iron oxides in concentric layers around a nucleus; lie **on** the sediment.

Cobalt-rich crusts: pavements precipitated onto **exposed hard rock** of **seamounts and ridges**; typically **richer in cobalt**, poorer in nickel and copper; harder to recover because attached to bedrock.

Both grow at a few **millimetres per million years**.

Andaman Sea is a **back-arc basin** behind the **Sunda subduction zone**; **Barren Island**, India's only active volcano, lies in this sea.

Law: **Offshore Areas Mineral (Development and Regulation) Act, 2002** and **Offshore Areas Mineral (Auction) Rules, 2024**.

Jurisdiction: offshore areas — **territorial waters, continental shelf and EEZ** — are **Union territory**, so offshore minerals are regulated **entirely by the Centre**, unlike onshore minerals where States grant leases.

Composite Licence combines **exploration and production** rights in one instrument — essential in a frontier area, so that an explorer is not outbid for what it discovers.

Distinguish: these blocks are within **India's own jurisdiction**. The deep seabed **beyond** national jurisdiction ("**the Area**") is administered by the **International Seabed Authority**, where India holds nodule exploration rights in the **Central Indian Ocean Basin**.

Exam hook: **Timeline:** tender documents from **1 October 2026**; **pre-bid conference 4 November 2026**; queries by **13 November**; tender purchase by **21 December**; bids by **28 December 2026**. Conducted on the **MSTC** platform.

• Robotic surgery and telerobotics in precision medicine

Body: 2 October 2026: Dr **Jitendra Singh**, MoS (I/C) Science and Technology and Earth Sciences, delivered the inaugural address at the **International Conference of the Society of Robotic Surgery (SRS India 2026)**.

Core claim: robotics is a **tool** that will extend across every medical specialty — "robotic medicine, robotic endocrinology, robotic cardiology" — not a surgery-specific technology.

A surgical robot is a master-slave system. It is **not autonomous** and makes no decisions: the surgeon at a console drives robotic arms holding instruments.

What it adds: **tremor filtration** (removing physiological hand tremor), **motion scaling** (large hand movement to small instrument movement), extra **degrees of freedom** through wristed instruments, and **ergonomics**.

What it lacks: little or no **haptic feedback** — the surgeon substitutes **vision for touch**.

Latency is the binding constraint on tele-robotics. Signals travel about **200 km per millisecond** in optical fibre, so **10,000 km** imposes roughly **50 ms each way** as a floor, doubled for a round trip, before switching and processing.

Imaging tolerates latency; surgery does not — a surgeon needs immediate visual confirmation to stop. Near-term tele-robotics is therefore **diagnosis, imaging, guidance and proctoring**.

The Minister reported performing a **robotic ultrasonography on a person 10,000 km away in Antarctica**, and framed the shift as "**the doctor being referred to the patient**" rather than the reverse.

Precision medicine: treatment tailored to the individual by **genetic profile, environmental conditions, lifestyle and dietary patterns**, rather than to the diagnosis alone.

Genome India Programme: 10,000 individuals sequenced; aspiration towards sequencing **every newborn**, which for **1.4 billion** people would require AI and robotics.

The genomic bottleneck is interpretation, not sequencing — identifying which variants are clinically actionable. Robotics addresses **sample handling**; AI addresses **interpretation**.

Nanomedicine and oral insulin: insulin is a **protein** digested before absorption, hence injection. Nano-scale delivery that protects it through the stomach would change diabetes management.

India's dual disease burden: infectious diseases coexisting with metabolic and lifestyle disorders, with later-life conditions appearing in younger people.

Exam hook: Caution: robotic systems are costly, and outcome evidence versus conventional minimally invasive surgery is **strong for some procedures and thin for others**.

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• India's first free-space QKD link — 5.56 km between BISAG-N and IIT Gandhinagar

Body: India's first free-space QKD link: 5.56 km, between BISAG-N and IIT Gandhinagar, demonstrated by QNu Labs with both partners. Field trial on the night of 27-28 September 2026; announced 3 October 2026.

BISAG-N = Bhaskaracharya National Institute for Space Applications and Geo-informatics — an autonomous scientific society under MeitY, working on space technology applications, satellite communication and geo-informatics.

Results: Quantum Bit Error Rate below 5%; secure key rate 230-260 bits per second.

Free-space vs fibre challenges: requires line of sight; atmospheric turbulence causes beam wander; diffraction spreads the beam; and solar background photons swamp single-photon detectors — hence the night trial.

Pointing, Acquisition and Tracking (PAT) system finds the counterpart, locks on and actively corrects alignment.

QBER is the fraction of compared key bits that disagree. Because measurement disturbs a quantum state, an eavesdropper necessarily raises the QBER — this is the basis of QKD security. Secure key distillation is possible below roughly 11% for BB84.

Key rate is not data rate. QKD distributes keys; the data is encrypted with conventional symmetric ciphers such as AES. 230 bps refreshes a 256-bit key about every second.

Two complementary layers: QNu Labs' Armos — hardware QKD, security from physics (no-cloning, measurement disturbance); BISAG-N's Vedic Kavach — software post-quantum cryptography with quantum random number generation, security from mathematics (typically lattice problems).

Why pair them: QKD needs a working physical link and fails if the channel is unavailable; PQC runs over any network, so the system degrades rather than fails.

Why free space matters: fibre loss is exponential and the no-cloning theorem forbids quantum repeaters that amplify, limiting fibre QKD to a few hundred km between trusted nodes. Most of the path to a satellite is vacuum, with atmospheric attenuation only over the first 10-20 km — so satellites enable intercontinental quantum links.

Exam hook: People: Dr Vinay Thakur, DG BISAG-N; Sunil Gupta, Co-founder and CEO, QNu Labs; Cmde Manish Tripathi (Retd.), In-charge ISTF, IIT Gandhinagar. QNu Labs founded 2016; IIT Gandhinagar founded 2008.

• National Supercomputing Mission at 40 machines and 68 petaflops

Body: The origin: the United States blocked the sale of a Cray X-MP to India in 1987-88 under COCOM, citing possible diversion to missile and nuclear design. India had sought it for weather forecasting.

C-DAC: Centre for Development of Advanced Computing, set up at Pune, 1988, under Vijay Bhatkar.

PARAM 8000: unveiled 1991 at 1 gigaflop; PARAM = PARAllel Machine; demonstrated at Zurich in 1991 and later exported, including to Germany and Russia. PARAM Yuva reached 54 teraflops.

Architecture: denial forced massively parallel processing — many commodity microprocessors rather than a few custom vector processors. The industry converged on the same choice a decade later.

Dual-use: HPC remains export-controlled; COCOM's successor, the Wassenaar Arrangement, was joined by India in December 2017.

FLOPS: Floating Point Operations Per Second. TF = trillion, PF = quadrillion, EF = quintillion.

NSM: launched April 2015, outlay about Rs 4,500 crore. Jointly steered by DST and MeitY; implemented by C-DAC Pune and IISc Bengaluru.

"Build approach" — assembly, manufacturing, design-and-manufacturing, run concurrently.

Status, September 2026: 40 supercomputers, 68 PF combined — 13 above 1 PF, 12 between 500 TF and 1 PF, 15 below 500 TF. Target 50 machines exceeding 123 PF.

Scale check: the world's fastest machine is about 2.19 EF = 2,190 PF, roughly 32 times all of NSM's capacity. NSM is a distribution programme, not a peak-performance one.

Rudra server: designed and developed by C-DAC, technology transferred to Indian EMS partners. 6,000 deployed in PARAM Rudra systems, 1,500 under manufacture. Indigenous interconnect at 100 and 200 Gbps, indigenous cooling, full HPC software stack.

PARAM Rudra deployments, September 2024: IUAC New Delhi, GMRT/NCRA Pune, S.N. Bose Centre Kolkata — about Rs 130 crore each.

The distinction to hold: indigenous server design is not an indigenous processor. The CPU die is not Indian; India's processor work is the VEGA family and the semiconductor mission.

PARAM Shavak: "supercomputing-in-a-box" for colleges.

Applications: genomics and drug discovery (COVID-19 repurposing and cardiac-risk prediction) · urban weather and pollution · seismic imaging · basin flood warning at 2 days, used on the Mahanadi · forest-fire spread, tested in the Sikkim Himalayas · materials and computational chemistry. Users include IMD, CWC, CPCB, AYUSH. Contributes to 11 SDGs.

People: over 16,000 researchers, 2,900+ PhD scholars, 400+ institutions, 1.5 crore+ compute jobs, 1,990+ publications. Backbone network — NKN. Skilling via EduHPC, HPC Shiksha, NPTEL on SWAYAM, AICTE faculty programmes.

Claim to flag: "India generates nearly 20% of the world's data" is an official assertion without an agreed measurement basis.

Exam hook: ESTIC-2026: second edition, 27-29 October 2026, Bharat Mandapam, organised by CSIR, 12 thematic areas.

Culture/Sport (1)

• Asian Games 2026 — three first-ever golds in a day, and back-to-back hockey

Body: 3 October 2026, Asian Games: India won **three first-ever golds** in a single day, plus two title retentions.

Aman Sehrawat — Men's 57 kg Freestyle Wrestling: India's **first-ever Asian Games gold** in the category. He had won **bronze at the previous Asian Games**.

Pranavi Sharath Urs — Women's Individual Golf: India's **first-ever gold** in the event.

Kumkum Anil Mohod — Recurve Individual: **first Indian woman** to win this gold, decided in a **shoot-off** (a single arrow each, closest to centre, after a tie).

Recurve is the Olympic archery discipline; compound archery — historically India's stronger event — joins the Olympic programme only from **Los Angeles 2028**. A recurve gold is therefore the more significant of the two.

Men's hockey retained gold: back-to-back Asian Games golds for the first time; fifth gold overall; and the **first Asian Games at which both India's men's and women's hockey teams won gold**.

An Asian Games hockey gold carries direct qualification for the Olympic Games.

India's hockey inheritance: **eight Olympic golds, six consecutive between 1928 and 1956**.

Men's cricket retained gold. Cricket returned to the Asian Games programme in the **2022** edition and is on the Olympic programme for **Los Angeles 2028** in the **T20** format.

Deepak Punia — bronze, Men's 97 kg Freestyle Wrestling.

What a first gold indicates: the full chain — international-standard coaching, domestic competition of sufficient quality, sports science, and depth. **Talent reaches finals; systems win them.**

Exam hook: The caveat: a single gold is consistent with a system **and** with one exceptional athlete. Depth is demonstrated by **succession** in the next cycle, not by one result.

