September 2025

Gamification
First Principle Thinking

InnovaTN
Decimal System

The Art of
Connecting Ideas

Young Scientist India

A Science & Innovation Magazine for School Students

INNOVATIONS FOR THE ELDERLY

PISHAROTH RAMA PISHAROTY
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PHOOLAN PRASAD

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Young Scientist India

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From the Editor's Desk

Welcome, Young Scientists!

Greetings to our bright, curious, and ever-questioning readers. It brings me great joy to present another inspiring edition of Young Scientist India, thoughtfully curated to spark ideas, strengthen skills and nurture innovation with purpose.

Our Cover Story, **Innovations for the Elderly**, invites you to look at science through the lens of empathy. Innovation becomes truly meaningful when it improves lives, and this story highlights how thoughtful design and scientific thinking can enhance dignity, independence and well-being for the elderly. It reminds us that great innovation always begins with understanding real human needs.

Innovation is not just about what you build, but how you think. This month's Innovation Training Modules introduce **Gamification and First Principles Thinking**—two powerful approaches that make learning engaging while helping you break down problems to their core. When challenges feel like games and ideas are built from fundamentals, creativity flourishes naturally.

Curiosity takes centre stage in this issue through articles that show how ideas are born, connected, and transformed into impact. In **DNA: Nature's Instruction Manual**, you will discover how something as tiny as DNA holds powerful lessons, not just about life, but about observation, patterns and evidence-based thinking. Complementing this is **The Art of Connecting Ideas**, which reveals how innovation often happens when knowledge from different fields comes together. This spirit of learning and collaboration comes alive in **InnovaTN**, where young minds from across Tamil Nadu turn classroom curiosity into real-world solutions. Together, these stories show that innovation begins with understanding, grows through connection, and reaches its true purpose when ideas are used to create meaningful change.

We also celebrate India's rich legacy of Indian inventions. From **Rockets** that take us beyond Earth, to **Yoga and Meditation** that strengthen the mind and body, India's innovations span both outer space and inner well-being. Even simple inventions like **Shampoo**, rooted in traditional Indian practices, show how everyday problems can be solved with scientific thinking and go on to impact the world.

This spirit of innovation continues through our profiles of inspiring Indian scientists and the remarkable ideas showcased in our GYS Avishkar and INPIRE Manak Award-Winners sections, where young innovators like you tackle challenges in health, agriculture, energy, safety, and sustainability.

I hope this edition encourages you to observe closely, think deeply and innovate responsibly.

Stay curious. Keep questioning. The future is yours to invent.

Vennela Valiveti, B. Des.
YSI Magazine Editor
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S&I Article

The Art of Connecting Ideas

Finding Inspiration for Innovation

Hey Young Scientists! Ever wondered how people come up with those "Aha!" moments that change the world? It often looks like magic, but guess what? It's usually an art you can learn: the art of **connecting ideas.**

Innovation isn't just about inventing something totally new.It's often about taking existing things, looking at them in a different way, and then **connectin**g them to solve a problem or create something awesome. Think of it like a DJ mixing two songs to create a brand new track, or a chef combining ingredients to invent a delicious new dish.

Ready to unlock your inner innovator? Let's dive in!

What Does "Connecting Ideas" Even Mean?

Imagine you have two puzzle pieces from different puzzles. They don't seem to fit. But what if one piece represents "problem X" and the other "solution Y"? When you find a way to make them click, that's innovation!
It's about:

1. **Observing:** Looking closely at the world around you.
2. **Questioning:** Asking "Why?" or "What if?"
3. **Linking:** Finding unexpected relationships between seemingly unrelated things.

Technique 1: The "What If...?" Game

This is your imagination's playground! Take an existing idea or problem and twist it with a "What if...?" question.

Example:

- **Original Idea:** Walking is how people move around.
- **What if...** people could fly? (Led to airplanes)
- **What if...** people could move without walking long distances in cities? (Led to cars, metros)

Consider how engineers looked at the problem of getting internet to rural areas where traditional cables were difficult to lay.

- **Original Idea:** Internet needs physical cables or towers.
- **What if...** we could use existing mobile phone networks more efficiently for data, even in remote villages?

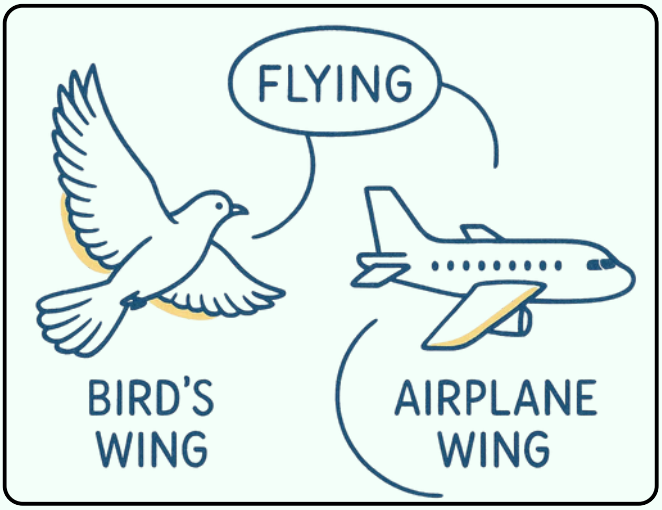
This thinking drove the expansion of affordable mobile internet across India, connecting millions who were previously offline. It wasn't just inventing a new technology, but connecting the idea of data access with the widespread reach of mobile networks.

Technique 2: The "Borrow & Adapt" Method

Why reinvent the wheel when you can borrow a great idea from one area and adapt it for another?

Example:

- **Idea from Nature:** A bird's wing structure.
- **Adapted to Engineering:** The design of an aeroplane wing.



Think about Aadhaar, India's massive biometric ID system for over a billion people.

- **Idea from Forensics/Security:** Using fingerprints and iris scans for individual identification.
- **Adapted for Governance/Inclusion:** What if we could use these unique biometrics to give every Indian a verifiable identity, making it easier to access services like banking, subsidies, and healthcare?

The genius wasn't just the biometric tech (which existed), but the audacious connection of that tech to a massive nation-building project, creating a unique digital infrastructure.

Technique 3: The "Solve Your Own Problem" Approach

Sometimes, the best innovations come from trying to fix something that annoys you! Your frustrations can be goldmines for new ideas.

Example:

- **Problem:** I keep losing my keys.
- **Solution Idea:** A small device that tracks them via my phone. (Led to Tile/smart trackers)

Consider the rise of India's Unified Payments Interface (UPI). Before UPI, making digital payments was clunky, often requiring complex bank details or specific apps.

- **Problem:** Making simple, instant digital payments between different banks is difficult.
- **Solution Idea:** What if we could create a universal system that links directly to bank accounts using just a simple ID, accessible via any app?

UPI emerged from connecting the need for simpler transactions with existing banking infrastructure and smartphone ubiquity. It solved a common pain point for millions of Indians and became a global benchmark for digital payments.

Technique 4: The "Mix-and-Match" Brainstorm

Take two completely unrelated concepts and force yourself to find a connection. It sounds silly, but it often sparks brilliant, unexpected ideas!

Example:

- **Concept 1:** A skateboard
- **Concept 2:** A suitcase
- **Mix-and-Match Idea:** What if a suitcase could transform into a rideable board, so you don't have to carry it? (Yes, this is a real product now!)

Think about the traditional Indian dabba (lunchbox delivery) system in Mumbai, often associated with the **dabbawalas.**

- **Concept 1:** A highly efficient, complex logistics network for delivering food.
- **Concept 2:** The rise of e-commerce and on-demand delivery for everything else.

While not a direct invention, the success of online food delivery apps (like **Swiggy** and **Zomato**) in India built upon an existing cultural understanding of efficient, small-scale logistics for food.

They essentially connected the traditional idea of food delivery with modern app technology and a wider range of restaurants, scaling it up dramatically. They saw the "delivery network" concept already thriving in a different form and adapted it for the digital age.

Where to Find Your Inspiration?

Innovation isn't about waiting for a lightning bolt moment. It's about being prepared to catch the lightning!

1. **Read Widely:** Science, history, fiction, current events. The more knowledge you have, the more dots you can connect.
2. **Observe Everything:** How does your fan work? Why does water run downhill? What makes a bridge strong? Look for patterns and mechanisms.
3. **Talk to People:** Discuss ideas with friends, teachers, family. Different perspectives can highlight connections you missed.
4. **Travel (Even Virtually):** See how other cultures solve problems. You might find a solution there that can be adapted for your context.
5. **Embrace "Boredom":** Sometimes, when your mind isn't busy, it starts playing with ideas and making unexpected links.

The Power of Failure (and Why It's Okay!)

Not every connected idea will be a success. In fact, most won't. And that's perfectly fine! Every "failed" attempt is a learning opportunity. It tells you what doesn't work, guiding you closer to what does.

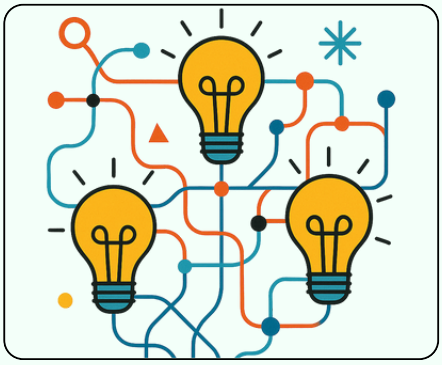
Many great innovators, from space scientists at ISRO designing complex missions to tech entrepreneurs building startups in Bengaluru, have faced setbacks. The key is to analyze, learn, and try connecting different ideas next time.

Your Journey as an Innovator

Innovation is a journey, not a destination. As young scientists in India, you have a unique vantage point. You live in a country rich with diverse challenges and incredible ingenuity. Look around you:

- **What problems do you see in your school, your neighbourhood, your city?**
- **What existing solutions, even simple ones, could be combined or improved?**
- **What ancient wisdom or traditional practices could be connected with modern technology?** (Think of how Ayurveda is being researched with modern scientific methods!)

Start small. Maybe it's redesigning your study space, finding a better way to organize school projects, or coming up with a clever way to reduce waste at home. Every little connection you make, every problem you try to solve, hones your innovative mind.



The "art of connecting ideas" is your superpower. It's what allowed Pingala to see patterns in poetry and lay the groundwork for computers, and what allows today's Indian scientists to send rockets to the Moon and Mars.

TUBO HOT - Energy Saving Water Heater and Money

S Bhardwaj
7th Class

We all have electrically operated water heating devices in our bathrooms. But what about the energy wastage that they cause? We need hot water to do many other jobs in our homes. Bhardwaj comes up with a solution - "TUBO HOT," or an energy and money saving water heater. There would be no accidents, and he has made the electric circuits and the combustion chambers of these 100% faultless.

Instead of the usual stand on a gas grill, a square hollow stand made of copper pipes and elbow connectors is used. The hollow stand will let the water get heated if the water connection is given to it while cooking. The trapping of heat between the pipe stand and the utensil will let the gas last longer as well. Money is saved too, as there will no longer be a need for a water heater.

The heated water will also be fortified with copper, which is beneficial to our health. The heated water can be stored in a storage tank. Cooking a meal for 4 needs at least 1 to 1.5 hours. Within this time, the hot tub can generate 5 liters of water heated up to a temperature of 100 degrees Celsius

(Source: GYS Avishkar Awards 2023 Booklet)

Link for the project's video presentation
https://www.youtube.com/watch?v=2aKhYbZLiSE

Flood Siren

Nageswer Mahto
7th Class

This is a flood siren machine designed to alert people about sudden rises in river water levels. Every year, many people and animals lose their lives due to the unexpected release of water from dams. Often, people bathing or staying near the riverside are swept away before they even realize the surge of water.

This machine can provide early warnings to people living near rivers, helping to prevent such tragedies. The device can also be highly effective in flood-prone areas.

It is cost-effective, and the government should consider installing these machines in vulnerable regions to enhance public safety.

(Source: INSPIRE MANAK NLEPC 2016 Booklet)

Indian Scientist

Pisharoth Rama Pisharoty

Padma Shri (1970)

(10TH FEB, 1909 TO 24TH SEPT 24, 2002)

Pisharoth Rama Pisharoty was a renowned Indian meteorologist and physicist, widely recognised as the **Father of Remote Sensing** in India. His visionary work modernised the study of India's complex monsoon systems and introduced advanced scientific methods to address critical challenges in agriculture and the environment. Through his leadership, India began linking atmospheric science and space-based observation with real-world applications that directly benefited society.

A pioneer of applied science, Pisharoty introduced remote sensing to India in the 1960s and led the country's first experiment using airborne sensors to detect coconut root-wilt disease in Kerala. An expert in atmospheric science, he made lasting contributions to the understanding of monsoons, tropical cyclones, and weather systems, strengthening India's forecasting capabilities and earning international recognition through collaborations with global scientific organisations.

Career Highlights and Academic Roles

Dr. Pisharoty held several key leadership positions that shaped India's scientific infrastructure:

- **Early Career (1932–1941):** Served as a Lecturer at Loyola College, Chennai, while working alongside C.V. Raman.
- **Meteorological Leadership (1942 onwards):** Joined the India Meteorological Department (IMD) in 1942.
- **Institute Founding (1962):** Became the Founder Director of the Indian Institute of Tropical Meteorology (IITM), Pune.
- **Space Technology Focus (1972–1975):** Served as Director of Remote Sensing and Satellite Meteorology at the Indian Space Research Organisation (ISRO).

Awards and Honours

Dr Pisharoty's significant contributions were recognised both nationally and internationally:

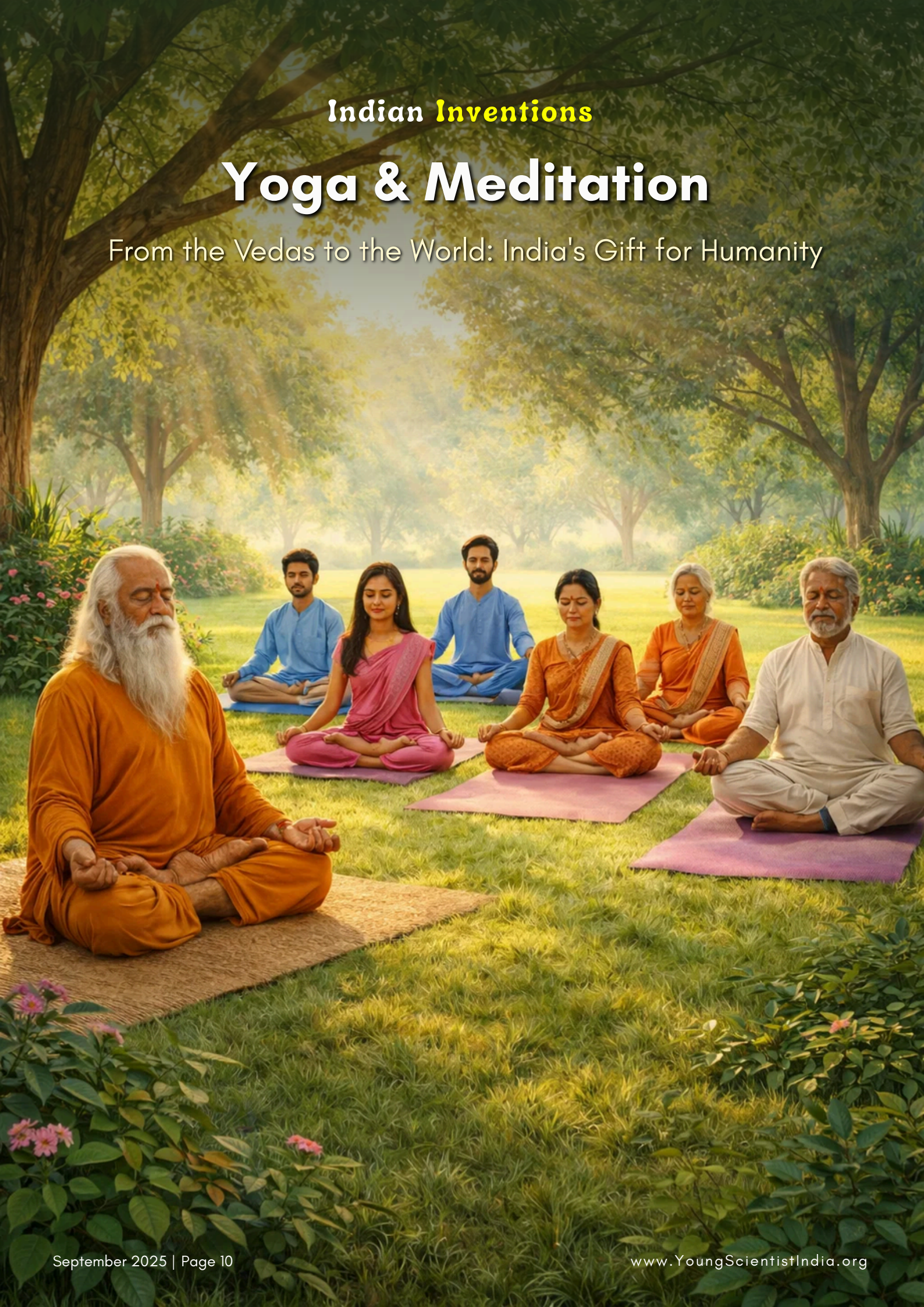
- Padma Shri (1970).
- IMO Prize (1989), the most prestigious international award in meteorology, given by the WMO.
- Raman Centenary Medal (1988) and K.R. Ramanathan Medal (1990).

His legacy endures through the ongoing work of ISRO and the IMD, which continue to advance his pioneering vision for applying remote sensing to benefit weather forecasting, agriculture, and environmental studies across India.

Indian Inventions

Yoga & Meditation

From the Vedas to the World: India's Gift for Humanity



When we think of inventions, we often imagine machines, gadgets, or scientific formulas. But some of the greatest inventions of India are not made of metal or circuits; they are systems of knowledge that help humans understand their bodies, minds, and the world around them. Among these, **Yoga and Meditation** stand out as India's most influential contributions to global well-being and scientific understanding.

Ancient Roots, Modern Relevance

Yoga and meditation originated in India thousands of years ago. Their earliest references appear in the Vedas and Upanishads, and they were later systematized in **Patanjali's Yoga Sutras**, written around 400 CE. What began as spiritual practices to understand the self have now become globally recognized techniques for health, fitness, and emotional balance.

Today, Yoga and meditation are practiced in over **190 countries,** taught in schools, researched in universities, recommended by doctors, and even used by astronauts in space. India's ancient invention has truly become a modern scientific tool.

Yoga: Science of the Body and Breath

Yoga is often misunderstood as just stretching or exercise. But traditionally, it is a complete science of how the body works. It combines physical postures (asanas), breathing techniques (pranayama), and disciplined habits to improve strength, flexibility, and balance.

Science confirms this:

- **Asanas** improve posture, reduce fatigue, and enhance muscle coordination.
- **Pranayama** increases lung capacity and regulates the nervous system.
- **Surya Namaskar** stimulates blood circulation and boosts metabolism.
- Regular yoga practice improves immunity and reduces the risk of lifestyle diseases.

Researchers at institutions like **AIIMS, IITs, and international medical universities** have found that yoga reduces stress hormones, improves heart health, sharpens cognitive functions, and even supports mental health therapy.

While the world views yoga as an ancient practice, modern science recognizes it as a **biomechanical, neurological, and psychological powerhouse.**

Meditation: The Invention for the Mind

If yoga strengthens the body, meditation shapes the mind. Meditation techniques like dhyana, mindfulness, and breathing awareness teach us to observe our thoughts and calm the mind.

Scientific studies using MRI scans show that meditation:

- Increases the thickness of the prefrontal cortex (linked to decision-making),

- Strengthens memory and attention span,
- Reduces anxiety, stress, and negative thinking,
- Improves emotional intelligence, and
- Enhances creativity.

Schools across India and the world now include meditation breaks because even 5-10 minutes can improve concentration and reduce exam stress. CEOs, athletes, doctors, and scientists use meditation to stay focused and energised. What began as an ancient Indian inner science is now a global mental fitness tool.

The Young Scientist Perspective

For students, yoga and meditation offer more than health benefits—they help develop qualities essential for scientific thinking and learning in everyday life:

- **Focus:** Meditation strengthens the attention needed for problem-solving and careful thinking.
- **Curiosity:** Yoga encourages self-awareness and observation, which are key scientific skills.
- **Discipline:** Daily practice builds routine and consistency, just like regular study habits.
- **Creativity:** A calm mind produces better ideas and solutions, especially during experiments.

In fact, many Indian scientists and innovators—from Dr. APJ Abdul Kalam to modern researchers—have spoken about using meditation to stay balanced, focused, and inspired throughout their work.

They found it especially helpful during challenging experiments, long study hours, and demanding research journeys in laboratories.

Indian Prime Minister Mr. Narendra Modi doing Yoga on International Yoga Day

India's Gift to the Future

In 2014, the United Nations declared June 21 as International Yoga Day, led by India's efforts. Millions now celebrate yoga each year across countries and cultures, showing how a knowledge system created in ancient India continues to shape global health, science, and everyday well-being.

As young readers and future scientists, you are part of the generation that will take this invention forward. Whether you dream of becoming a doctor, engineer, astronaut, or researcher, yoga and meditation can become your tools for clarity, strength, resilience, and balanced thinking.

A Call to Action

Try dedicating just 15 minutes daily—10 minutes for yoga and 5 for meditation. You'll notice better focus in class, improved calmness before exams, and a greater connection between your body and mind over time.

India invented yoga and meditation for humanity—not just to be practiced, but to be lived. And today, you have the opportunity to carry this legacy into the future with curiosity, discipline, and purpose.

Survey of India (SoI), Dehradun

Imagine holding a map that shows every mountain, river, road and border of our country. Who makes these maps so accurate? The answer lies in one of India's oldest and most important scientific institutions: the Survey of India (SoI), based in Dehradun, Uttarakhand.

The Survey of India is the national mapping organization of our country. Established way back in 1767, it has been **measuring and mapping India for over 250 years!** From drawing the earliest paper maps to using satellites and drones today, SoI has been at the forefront of combining science, technology, and geography to understand the land we live on.

The Science of Mapping

Surveying is much more than drawing maps; it's a blend of mathematics, physics, and geography. Scientists and surveyors at SoI measure distances, heights, and angles between points on the Earth's surface to create precise maps. They use technologies like GPS, remote sensing, and digital cartography to represent India's diverse terrain from the snowy Himalayas to the sandy deserts of Rajasthan.

Do you know that SoI was behind the **Great Trigonometrical Survey of India**, one of the most remarkable scientific projects of the 19th century? It was during this survey that the world's highest peak, Mount Everest, was measured for the first time in 1852!

The institution's accuracy and dedication made it one of the world's most respected mapping agencies.

Maps that Shape Development

Today, the Survey of India supports everything from defence and disaster management to urban planning and environmental conservation. Its maps guide engineers building roads and railways, scientists studying earthquakes and administrators planning cities. It also helps in creating digital maps that power navigation apps and geospatial technologies, tools that we use every day!

Inspiring Young Explorers

For students, SoI is a place where science meets adventure. Its scientists often visit schools and colleges to teach about geodesy, topography, and GIS (Geographic Information Systems), modern tools used to map the Earth.

Mapping the Future

The Survey of India isn't just about the past; it's leading India into a digital mapping revolution. By blending tradition with technology, it ensures that every road, hill, and village is represented accurately. For young scientists, it's a reminder that science doesn't just explore the stars, it also helps us understand our own planet, one map at a time.

Cover Story

Innovations for the Elderly

In many homes, the day begins slowly for elderly family members. Medicines are carefully placed on the table. Walking sticks are kept close. A reminder is repeated more than once, like "Be careful on the stairs."

These moments may seem ordinary, but they reveal something important. As people grow older, even small daily tasks can become difficult. Remembering medicines, moving safely, using technology, or even stepping outside alone can require effort and support.

For a young mind interested in science and innovation, these everyday moments raise an important question:

Can these challenges be solved better? This question is where innovation truly begins.

Innovation Begins with Observation

Innovation is often imagined as something that happens in research labs or technology companies. In reality, it usually begins much closer to home.

The first step for any student innovator is observation.

Observation means paying attention to how elderly people go about their daily lives:

- How do they move around the house?
- Which tasks take extra time or effort?
- When do they hesitate or ask for help?
- Which activities do they avoid completely?

Often, elderly people do not openly complain. Their difficulties appear quietly in repeated actions, careful movements, or reliance on reminders.

Students who learn to observe patiently begin to notice patterns. These patterns point directly to problems worth solving.

From Many Problems to One Clear Problem

Once observation is done, students usually discover many challenges at once. This is natural. However, effective innovation requires focus.

A helpful method is to group problems into broad areas:

- **Health and Physical Challenges:** Difficulty in walking, reduced vision or hearing, joint pain, memory loss.
- **Safety and Security Concerns:** Fear of falling, accidents at home, emergencies while alone.
- **Independence and Accessibility:** Using mobile phones, banking services, transport, or household appliances.
- **Emotional and Social Well-being:** Loneliness, reduced social interaction, loss of confidence.

After grouping, the next step is to choose one specific problem.

Instead of trying to "help the elderly," an innovator focuses on something precise, such as:

- Forgetting to take medicines on time
- Fear of slipping in bathrooms
- Difficulty using small buttons or screens

A clear problem definition is the foundation of meaningful innovation.

Asking the Right Innovation Questions

Once a problem is clearly identified, students can frame it as an innovation question. A widely used approach is the "How might we" method.

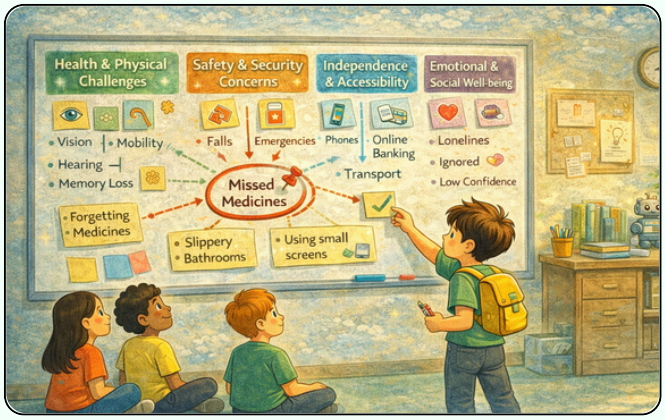
For example:

- How might we help elderly people remember their medicines?
- How might we improve safety for seniors walking at night?
- How might we reduce loneliness for elderly people living alone?

These questions are important because they:

- Keep solutions open-ended
- Encourage multiple ideas
- Avoid jumping to conclusions too early

Innovation is not about finding the first answer. It is about exploring better answers.



Designing Solutions That Actually Work

One common misunderstanding is that innovation must involve advanced technology. For elderly users, this is often not true.

The most effective innovations for the elderly are:

- Simple to use
- Easy to understand
- Affordable
- Designed around daily habits

Students should think beyond apps and devices, and consider:

- Changes in design (shape, size, colour)
- Visual or audio reminders
- Small environmental improvements
- Everyday objects used differently

An effective solution is not the most impressive one; it is the one that an elderly person can use comfortably without assistance.

Innovations for the Elderly: India and the World

Across the world, innovators have addressed elderly challenges by focusing on real needs rather than complexity.

Examples from India

In India, many innovations for the elderly are designed with affordability and simplicity in mind.

Emergency alert devices allow elderly people to call for help at the press of a button during a fall or medical emergency. These devices are often designed to work without smartphones.

Innovators have also improved walking aids by adding better grip, balance support, and visibility for low-light conditions. Low-cost vision aids have enabled elderly people to continue reading, managing finances, and staying independent.

Global Examples

In other countries with ageing populations, similar thinking has guided innovation.

In Japan, wearable devices detect falls and automatically alert caregivers. In parts of Europe, pill dispensers release medicines at the correct time with gentle reminders. In the United States, voice-controlled assistants help elderly users make calls or seek help without navigating screens.

Despite differences in technology, the core idea remains the same:

Design for ease, dignity, and independence.

When Students Become Innovators: Learning from Competitions

Some of the most inspiring innovations for the elderly have been developed by school students.

INSPIRE MANAK

Through the INSPIRE MANAK programme, students across India have identified problems faced by elderly people in their homes and communities.

Student innovations have included:

- Medicine reminder systems
- Improved walking aids
- Anti-slip footwear designs
- Household safety tools

Many of these projects started as simple sketches or basic models. What made them stand out was a clear understanding of the problem and originality of thought.

The focus of such competitions is not technical complexity, but usefulness and relevance.

GYS Avishkar Awards

Platforms like GYS Avishkar have encouraged students to design solutions grounded in everyday observations.

Students have worked on:

- Safer home environments
- Assistive tools for daily activities
- Designs that support elderly independence

These projects demonstrate that meaningful innovation can begin with a conversation at home and a willingness to observe carefully.

From Observation to Prototype: A Simple Path

Students interested in innovating for the elderly can follow a straightforward process:

1. Observe an elderly person's daily routine
2. Note down repeated difficulties
3. Select one specific problem
4. Frame it as a "How might we" question
5. Sketch or model possible solutions
6. Share the idea and gather feedback

This process does not require perfection. It encourages learning and improvement.

Meaningful innovation begins with empathy—observing real problems and designing thoughtful solutions with care.

The future lies in simple, human-centred ideas that quietly improve everyday life with dignity and purpose.

Induction Balance

Induction Balance, a weight measuring system, runs on 230 V A/C. According to Faraday's Law, an EMF is produced in the secondary coil by electrical induction through the primary coil. The coils are fixed with a spring. The magnetic flux is induced into a greater number of turns when the secondary coil enters the primary coil by putting some weight upon the tray at the top of the coil. More turns gain more EMF due to induction. The e.m.f. is measured by a voltmeter. After calibrating the EMF, we can determine the measuring weight.

Rimi Mondal
11th Class

(Source: INSPIRE MANAK NLEPC 2015 Booklet)

Agro Four-in-One

This affordable and eco-friendly project saves time, energy, and effort of farmers while making farming much easier and smarter. This amazing farming machine can sow seeds, spray pesticides, add fertilisers, and even carry things — all by itself! The best part? Only one person is needed to operate it. The machine works using a gear motor powered from a battery, which sprays liquid from a tank through a pipe with a nozzle.

Aditi Chandrakant Salunkhe
10th Class

To spread powdered or crystal fertilizers, the machine uses a rotating dish that throws them around the field evenly.

The machine is powered by two batteries that are charged with solar energy. You can control the machine with a remote, and it moves 11.25 meters in one minute! Parts like the fertilizer sprayer or seed sower can be removed to make the machine flexible and easy to use. Also, the machine is made from plastic, which means it is light and doesn't need much maintenance.

(Source: INSPIRE MANAK NLEPC 2014 Booklet)

Indian Scientist

Prem Shanker Goel

Padma Shri (2001)

(BORN ON 20 APRIL 1947)

Prem Shanker Goel is an Indian space scientist, former secretary at the Department of Ocean Development, Ministry of Earth Sciences, Government of India, and former director of the Indian Space Research Organisation. In recognition of his contributions, the Government of India honored him with the Padma Shri, the nation's fourth-highest civilian award, in 2001.

Scientific Contribution:

- Spin axis orientation systems for Bhaskara I & II and magnetic control for Rohini satellites.
- Momentum-biased 3-axis control for APPLE.
- Zero-momentum biased control for IRS
- Configuration-biased attitude control for INSAT-II.
- Agile "step-and-stare" control for TES
- Re-entry guidance for the SRE mission.

Government and Scientific Leadership:

He retired from ISRO in 2005 but continued to be involved in scientific and educational initiatives. Served as Secretary, Department of Ocean Development.

Oversaw its transformation into the Ministry of Earth Sciences by integrating the ocean, atmosphere and geosciences departments.

Became the **first Chairman** of the global **Earth Commission**. Currently serves in advisory and academic roles.

Honorary Distinguished Professor at ISRO HQ

Awards

- **Padma Shri (2001)** One of India's highest civilian honors, awarded by the Government of India for distinguished service in science and engineering.
- **Vikram Sarabhai Research Award** for excellence in space science and technology.
- **Om Prakash Bhasin Award for Science and Technology Honoured** for his pioneering innovations and leadership in engineering sciences.
- **Vasvik Industrial Research Award** for achievements in electrical and electronic sciences.

Academic Legacy:

Dr Prem Shanker Goel played a key role in developing satellite control systems, several major ISRO missions, including Aryabhata, INSAT and IRS, by developing indigenous technologies that made India self-reliant in space science. As Director of the ISRO Satellite Centre and later as Secretary of the Department of Ocean Development, he contributed to the creation of the Ministry of Earth Sciences, integrating ocean, atmospheric and climate research.

Innovation Training Module

Gamification

Learning is often seen as serious work with textbooks, notes, exams and marks. But some of the most powerful learning happens when we are playing. Gamification brings this idea into education and innovation.

What is Gamification?

Gamification means using elements of games such as **challenges, points, levels, roles, time limits, and rewards** in learning and problem-solving. It does not mean playing video games in class. Instead, it means making learning active, engaging and goal-oriented, just like a game.

Gamification is especially useful in innovation because innovation needs curiosity, experimentation, teamwork and the courage to fail and try again, all things that games naturally teach us.

How Students Can USE Gamification

Knowing what gamification is is only the first step. This training module focuses on how students can apply gamification deliberately to study better, solve problems creatively, and become confident innovators.

1. How Gamification Changes the Way You See a Problem

Let's compare two ways of looking at the same problem.

Without Gamification:
"This topic is difficult."
"What if I get it wrong?"
"I'll try to finish it quickly."

With Gamification:
"This is a challenge."
"Let's test one strategy."
"How can I improve in the next round?"

Gamification changes your mindset. Problems stop feeling like burdens and start feeling like challenges to explore. This mental shift is the foundation of innovation.

2. Turning Any Task into a Game (The Core Skill)

Students can gamify almost any task by asking three questions:

1. What is the mission?
2. What are the rules or limits?
3. How will progress or success be measured?

Example: Studying a Chapter
Mission: Explain the topic using a drawing or model

Rules: No copying from the textbook
Scoring: Clarity, creativity, and accuracy

The same content becomes more engaging and memorable.

3. Where Students Can Use Gamification

a) In Classroom Learning

Lessons can be turned into:

- Quests
- Group challenges
- Time-bound missions
- Peer competitions

For example, instead of writing answers about ecosystems, teams compete to design the most balanced ecosystem model under given conditions.

b) In Science & Innovation Projects

Gamification is extremely powerful for projects.

Without gamification:
Students rush to finish the project.

With gamification:
Projects are divided into levels:

Level 1: Identify the problem
Level 2: Research ideas
Level 3: Build a simple model
Level 4: Test and improve
Level 5: Present the solution

Each level keeps students motivated and focused.

c) In Teamwork and Group Activities

Group work often fails when only one student does everything. Gamification fixes this by assigning roles, such as:

- Researcher
- Designer
- Builder
- Tester
- Presenter

Each role earns points for effort and contribution, encouraging fair participation and collaboration.

d) In Real-Life School or Community Problems

Gamification can be used beyond textbooks.

Example:
Mission- Reduce plastic waste in school
Challenges-

- Track daily plastic use
- Design alternatives
- Create awareness ideas

Students learn to solve real problems while enjoying the process.

4. Learning from Failure: A Key Innovation Skill

In games, losing is normal. You fail, learn, and try again. Gamification brings this attitude into learning.

Instead of asking,
"Why did I fail?"

Students learn to ask,
"What did this attempt teach me?"

This makes students less afraid of mistakes and more willing to experiment—an essential quality of innovators.

5. Using Rules and Limits to Boost Creativity

Games always have rules, and those rules actually make games more interesting. The same applies to innovation.

Try challenges like:

- Build using only waste material
- Explain an idea in three minutes
- Solve a problem without using technology

Constraints push the brain to think creatively instead of relying on easy answers.

6. Tracking Progress Like a Game

Games show progress through levels, scores, and badges. Students can do the same by:

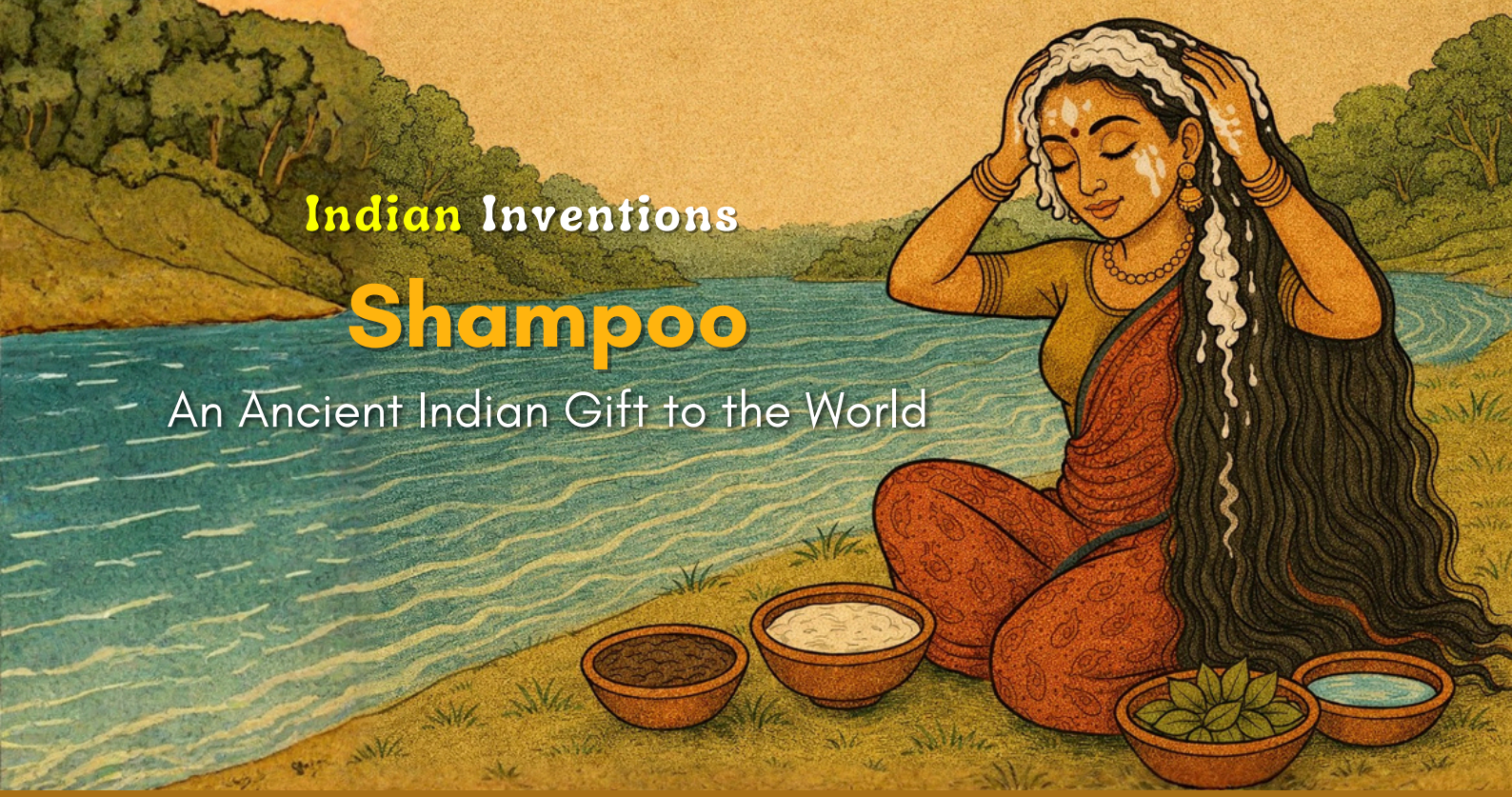
- Creating progress charts
- Tracking skill levels (Beginner → Explorer → Innovator)
- Celebrating effort, not just results

Seeing progress keeps motivation high.

Conclusion:

Gamification does not make learning childish—it makes learning powerful. It teaches students to enjoy challenges, learn from failure, and think step by step.

Innovation does not begin with perfect answers. It begins when students feel safe to try, fail, and try again.



Indian Inventions

Shampoo

An Ancient Indian Gift to the World

The word you use every time you wash your hair -"**shampoo**"- is a direct, often unnoticed, gift from India. It comes from the Hindi word "**chāmpo**", meaning to **massage** or **knead**.

The origins of shampoo were not in a bottle, but in a therapeutic head massage ritual. As early as the 15th century, and famously during the Mughal era (notably around 1762 in Bengal), Indian innovators used a combination of natural ingredients to cleanse and nourish hair while performing a relaxing head treatment.

The earliest recorded forms of this cleanser were made by boiling indigenous natural ingredients, including:

- **Sapindus:** The pulp of this small shrub (part of the Lychee family) contains natural soap-like substances called saponins, which created the original gentle lather.
- **Amla (Indian Gooseberry) & Hibiscus**: Added for their nourishing properties to keep hair healthy and shiny.

This practice, known as the "chāmpo," was much more than simple cleaning; it was a blend of hygiene and therapy.

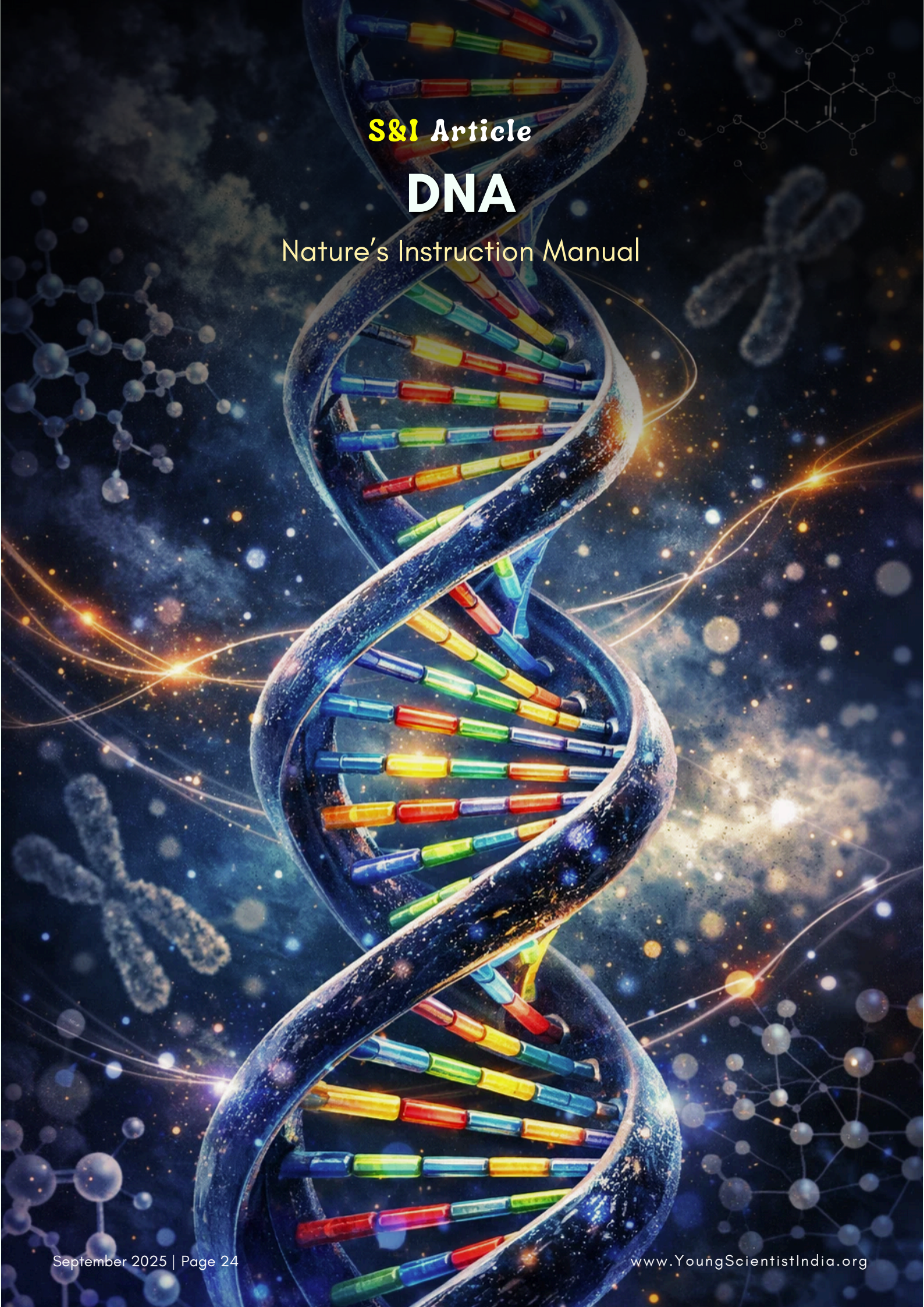
The journey of "chāmpo" to your modern shower began in the late 18th century. British colonial traders in India were so impressed by the practice that they introduced it to Europe. Over time, European chemists replaced the natural herbal ingredients with modern synthetic detergents (surfactants) to create the liquid soap we recognize today.

While the ingredients have changed, the fundamental function—cleansing and nourishing the hair—remains connected to the original therapeutic practice developed centuries ago in India. Your daily routine is a direct link to this rich history of Indian innovation!

S&I Article

DNA

Nature's Instruction Manual



What is DNA? Why is it important?

DNA stands for **deoxyribonucleic acid**. It is the **blueprint of life**, carrying instructions that make each living being unique. DNA is found in the nucleus of every cell and controls the function of the body.

DNA is used in many areas, from science to everyday life! Here are a few key places where DNA plays a role.

Where Is DNA Found?

DNA is present:

Inside the **nucleus** of every cell. Packed tightly into structures called **chromosomes**. In humans, there are **46 chromosomes** (23 pairs).

DNA in Simple Words: Nature's Instruction Manual

Think of DNA as a **long instruction book** written inside every living cell.

Each instruction tells the body how to grow, repair and function. These instructions are written using just **four chemical letters:**

- A (Adenine)
- T (Thymine)
- G (Guanine)
- C (Cytosine)

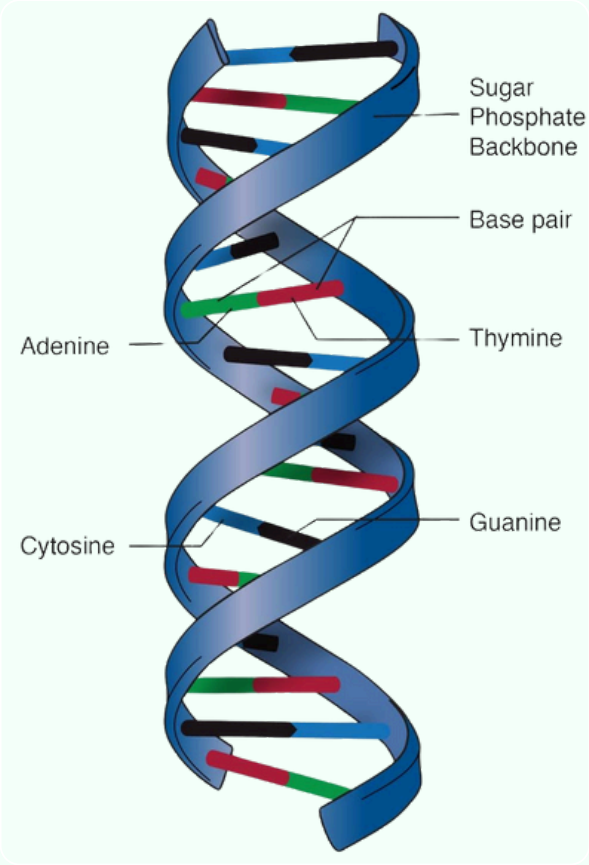
Medicine & Health: Used in genetic testing, diagnosing diseases, developing treatments, and researching hereditary conditions.

Forensics: Helps solve crimes by analysing genetic material left at crime scenes.

Agriculture: Used in genetic engineering to create disease-resistant crops and improve food quality.

Ancestry & Genealogy: Helps trace family history and find genetic connections between people.

Biotechnology: Used in producing medicines, like insulin and in synthetic biology to engineer organisms.



The Role of DNA in Science, Agriculture, Medicine, etc.

1. Healthcare & Medicine

Applications:

Personalised treatments based on individual DNA. Early detection of diseases through genetic screening. CRISPR: A powerful gene-editing tool to correct faulty genes.

2. Agriculture

Applications:

GMO Crops (Genetically Modified Organisms): Engineered to resist pests, diseases, and drought.

Gene Banks: Help conserve and protect endangered plant species.

3. Forensics & Justice

Applications:

Solving crimes using DNA fingerprinting. Identifying missing persons and disaster victims.

4. Environment & Conservation

Applications:

DNA Barcoding: Tracks and identifies endangered species.

Genetic Tools: Prevent the extinction of rare species. Monitoring biodiversity and the impacts of climate change.

The Future of DNA Technology

DNA science will shape our world in areas such as

1. Disease prevention
2. Customized nutrition
3. Green energy and biofuels
4. Synthetic biology (creating new life forms)

DNA and Agriculture:

Dr. M.S. Swaminathan

Known as the Father of the Green Revolution in India. During the Bengal Famine of 1943, As a young man, he witnessed the devastating famine that killed millions. This left a lasting impression and motivated him to work toward food security in India. Helped India become self-sufficient in food grain production.

Focused on sustainable agriculture and farmer welfare. Awarded the World Food Prize in 1987, Padma Shri (1967), Padma Bhushan (1972), Padma Vibhushan (1989). Nobel Laureate Dr Norman Borlaug collaborated closely with Borlaug and was inspired by his work on high-yielding wheat varieties. This helped him develop similar strategies for India.

Subhash Palekar

Pioneer of Natural Farming. He developed Zero Budget Natural Farming (ZBNF). Encourages farmers to use no chemical inputs, only natural ones from local sources. Inspired lakhs of farmers across India. Awarded Padma Shri in 2016.

Gauri Devi

Champion of Women in Agriculture (from Uttarakhand). Known for organising women farmers and promoting community forest conservation. She turned barren hills green through traditional farming and community work.

Kamala Pujari

Tribal Organic Farmer from Odisha. Preserved traditional seeds and organic farming techniques. Promoted indigenous farming and food diversity. Received Padma Shri in 2019.

Use of DNA for farmers in crops

1. DNA helps to choose better seeds:

Scientists study the DNA of plants to identify genes responsible for traits like bigger fruits, higher yield, drought resistance and pest resistance, helping farmers grow healthier, stronger, more productive crops and improve long-term food security while reducing farming risks, costs, and dependence on chemical inputs, especially under changing climate conditions.

2. Animal Breeding

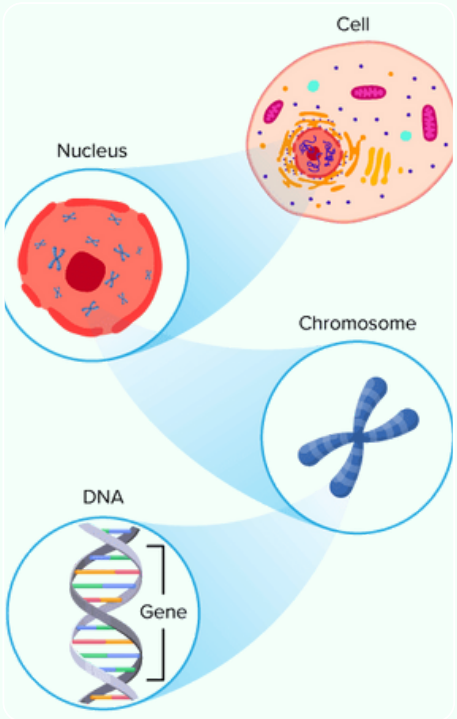
Farmers use DNA tests to select animals (like cows or goats) with the best traits to give more milk, faster growth and disease resistance.

3. Flower breeding

Flowers are grown for medicines, decorations, flavourings, fragrances, perfumes, the oil industry and other uses. The floriculture industry is experiencing rapid growth, with advancements in technology enhancing flower cultivation and distribution.

4. Marine Biology:

It is a study about the ocean, including oysters, corals and other living organisms, as well as marine ecosystems. Marine biology helps students understand the importance of oceans for climate, biodiversity and human life.



DNA and Health:

Some diseases are linked to **changes in DNA**:

- Thalassemia
- Sickle cell anaemia
- Certain cancers
- Diabetes (genetic risk)

In India, doctors now use **genetic screening** to:

- Detect diseases early
- Plan better treatments
- Advise families on preventive care

This is called **personalised medicine,** where treatment depends on a person's DNA.

DNA and Innovation:

DNA is now compared to data.
Scientists are exploring:

- DNA as a **data storage system**
- Combining DNA studies with **AI**
- Using computers to analyse genetic patterns

This creates **interdisciplinary careers:**

- Bioinformatics
- Computational biology
- Genetic data analysis

DNA and Climate Change Solutions

DNA research helps in:

1. Developing climate-resilient crops
2. Protecting endangered species
3. Preserving biodiversity
4. Understanding how organisms adapt to change

DNA teaches young innovators that small things can have a huge impact, showing how science works best when applied to real problems. Evidence matters more than belief, and innovation must serve society responsibly. DNA is not just inside your body; it is inside India's future. Every discovery in DNA science begins with curiosity, careful observation, questioning, and the courage to explore the unknown with imagination and responsibility.

Reduce and Produce

Observing concerns like lack of electricity and uncontrolled waste generation in society, Tanush came up with a solution through which accumulated waste is consumed, hence "reducing" it, and at the same time, more electricity is generated, in other words, "produced."

T Tanush
9th Class

Two stands are attached to a cardboard sheet. Four solar panels are placed on the stand using clips, which are connected to a light bulb and a buzzer using connecting wires. Between the two stands, a pit made of wire mesh is placed to put in dry waste. When the waste is set on fire, the solar plates on both sides absorb the generated heat and convert the heat energy into electrical energy. Thus, it lights up the light bulb and rings the connected buzzer.

(Source: GYS Avishkar Awards 2023 Booklet)

Link for the project's video presentation
https://www.youtube.com/watch?v=3AexdsM4170

Cow Dung & Cow Curd Use Instead of Chemical Fertilisers

Curd Amrutha is a natural, easy-to-make, and economical fertilizer that can be used instead of chemical fertilizers to kill pests on trees and plants. Curd Amrutha can be prepared by mixing cow dung and cow curd.

Take one liter of the mixture in a bowl, add some pieces of copper, and preserve it for 15 days. Then remove the copper pieces and add ten liters of water and mix it well. Curd Amrutha is ready. Using a spray machine, this can be sprayed on trees and plants. It works effectively as a natural pesticide.

J. Hasini
10th Class

(Source: GYS Avishkar Awards 2023 Booklet)

Link for the project's video presentation
https://www.youtube.com/watch?v=x0LXTGkdsfE

Indian Scientist

Varun Bhisham Sahni

Shanti Swarup Bhatnagar Prize (2000)

(BORN ON MARCH 29, 1956)

Imagine the universe as a giant, incredibly complex movie. Dr. Varun Bhisham Sahni is one of the **world's leading theoretical physicists** who helps write the subtitles and maps the scenes of that movie. A Distinguished Professor at the Inter-University Centre for Astronomy and Astrophysics (IUCAA) in Pune, Dr. Sahni is celebrated for solving the biggest mysteries about how the universe began, what makes it grow, and how it is organized.

Scientific Contributions

Dr. Sahni's scientific journey reads like a detective story about the universe—one where the clues are hidden in starlight, galaxies, and cosmic patterns. Instead of building rockets or telescopes, he designed powerful "diagnostic tools" that help scientists interpret what they see, much like special lenses that reveal invisible details of the cosmos.

One of his most important contributions is to the study of **dark energy**, the mysterious force that is pushing the universe to expand faster and faster.

To understand this cosmic mystery, Dr. Sahni developed innovative tools such as the Statefinder and Om diagnostics. These tools allow scientists to analyse data from telescopes and distinguish between different theories of dark energy, bringing clarity to one of the biggest puzzles in modern science.

Dr. Sahni also made major advances in understanding the **early universe**. He helped develop the Cosmic No-Hair Theorem, which explains how a brief but explosive phase called inflation smoothed out the universe soon after the Big Bang. This work helps explain why the universe looks so uniform today. In addition, he proposed models that link inflation and dark energy into a single, elegant idea.

Finally, his research helped decode the **Cosmic Web**—the vast network of galaxies and empty spaces that fills the universe. Using mathematical tools called Shapefinders, he revealed how matter organized itself after the Big Bang, turning chaos into the grand structure we observe today.

Honours and Legacy

For his excellence in the physical sciences, Dr Sahni has received India's highest honours. These include the **Shanti Swarup Bhatnagar Prize (2000)** and the **Homi Bhabha Medal (2014)**. He is an elected fellow of India's leading science academies (IAS, INSA, NASI). Prof. Sahni's legacy lies in providing the scientific community with indispensable tools to explore the deepest mysteries of the universe.

Innovation Training Module

First Principle Thinking

Let's start with a quick question.

Why do school bags have two straps?
Why do classrooms have rows of benches?
Why do exams last exactly three hours?

Most of us answer, "Because that's how it is."

But innovators ask something different:
"Does it have to be this way?"

Welcome to First Principles Thinking—a powerful way of thinking that helps you break problems down, question assumptions, and build better solutions from scratch.

What Is First Principles Thinking?

First principles thinking means forgetting how things are usually done and focusing on what is truly needed.
Instead of copying existing solutions, you:

- Break a problem into basic facts
- Remove assumptions
- Build a new solution step by step

Think of it like dismantling a toy to understand how it works; then rebuilding it better

Activity 1: Spot the Assumptions

Read this sentence:
> "Students learn best by sitting quietly and listening."
Now ask yourself:

- Is this a fact or an assumption?
- Does it apply to everyone?
- Can learning happen in other ways?

If you questioned it, congratulations! You just used first principles thinking.

Why Innovators Use First Principles Thinking

Most people improve things a little. Innovators change things completely.

First principles thinking helps you:

- Think independently
- Find original ideas
- Feel confident asking "why"
- Avoid the trap of "this is how it's always been"

It turns you from a follower into a creator.

The Training Game: How to Practice First Principles Thinking

Step 1: Name the Problem Clearly

Let's practice.
❌ "School is boring."
✅ "Too much passive listening makes learning boring."

Activity 2: Problem Precision

Pick one problem and rewrite it clearly:

- Homework is stressful
- Classes feel rushed
- Group work doesn't work well

Clear problems lead to better solutions.

Step 2: Break It Down into Facts

Now write down only what must exist.

Example: Homework
Facts:

- Students need practice
- Teachers need feedback

Assumptions:

- Homework must be written
- Homework must be long
- Homework must be done at home

Activity 3: Fact vs Assumption

Draw two columns and list facts and assumptions for:

- Exams
- School uniforms
- Timetables

You'll be surprised how many "rules" are actually optional.

Step 3: Ask "Why?" Again and Again

Innovators ask "why" multiple times.

- Why homework? → For practice
- Why written? → Because it's easy to check
- Why not something else? → Good question!

This step opens doors to new ideas.

Activity 4: The 5 Whys

Pick one assumption and ask "why" five times. Stop only when you reach a basic need.

Step 4: Rebuild from Scratch

Now comes the fun part—rebuilding.
If the real goal is understanding, then solutions could be:

- Teaching a friend
- Making a model
- Creating a quiz
- Recording an explanation

Activity 5: Redesign Challenge

Redesign one of these from scratch:

- A school bag
- A classroom
- A test
- A lunch break

Ignore "how it's done now." Focus only on purpose.

Step 5: Test, Learn, Improve

First principles thinking is not about perfect ideas. It's about trying, learning, and improving.

Just like science experiments:

- Some ideas fail
- Some partly work
- Some surprise you

Each attempt teaches you something new.

With vs Without First Principles Thinking

Without it:

- Copying examples
- Fear of mistakes
- Same solutions every year

With it:

- Original ideas
- Curiosity instead of fear
- Confidence to experiment

This mindset shift is what creates innovators.

Where Can Students Use This Skill?

You can use first principles thinking:

- In science projects
- In innovation competitions
- During group work
- In daily life problems
- Even in planning your study time

Any time something feels inefficient or unfair, this tool can help.

Final Challenge: Think Like an Innovator

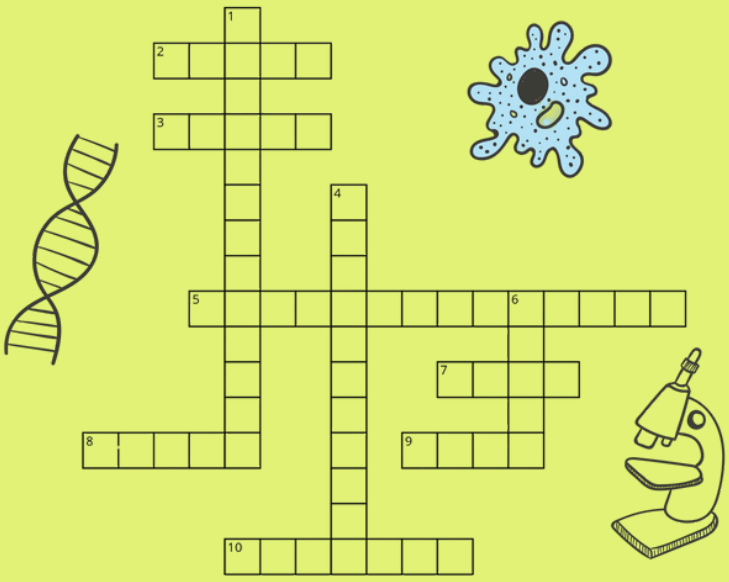
Before you accept anything as "normal," pause and ask:

- What is the real goal?
- What assumptions exist?
- What if we started from zero?

First principles thinking trains your brain to see possibilities where others see rules.

And that is how innovation begins—not with answers, but with better questions. 🚀

Word Search 2508
(Biology)



Across

[2] The hard covering that protects seeds
[3] The body's control center that coordinates activities and functions
[5] The process by which plants make their own food using sunlight
[7] The part of the plant that absorbs sunlight and helps in photosynthesis
[8] The tiny units that make up all living things
[9] A part of a plant that grows down into the soil to take in water and nutrients
[10] The study of living organisms

Down

[1] The process of a caterpillar turning into a butterfly
[4] The substance that gives plants their green color and helps in photosynthesis
[6] The pumping organ responsible for circulating blood in the body

(Answers on Back Cover Inside)

Sri Sathya Sai Space Theatre

Have you ever wanted to fly through the cosmos without leaving Earth? That's exactly what a **planetarium**—or space theatre—lets you do! Think of it as a giant, domed cinema where the ceiling is the sky. Special, high-tech projectors beam images of stars, distant planets, nebulae, and even space missions onto the dome, making you feel completely immersed in the universe. It's an incredible educational tool that brings astronomy, physics, and maths to life by showing you the scale and motion of celestial bodies in a dramatic, unforgettable way.

One of India's most special venues for this cosmic journey is the **Sri Sathya Sai Space Theatre** in Puttaparthi, Andhra Pradesh. Founded way back in 1985, this planetarium is the only one of its kind between the major cities of Bangalore and Hyderabad, making advanced science accessible in a more rural area—a true mission of educational outreach.

What makes it a must-see?

First, the entry is completely free, honoring its founder's vision of accessible education for everyone.

Inside, the theater uses an advanced **Spitz Space Systems-512** projector that can display a breathtaking 4054 stars and 88 recognized constellations.

In 2011, the theater upgraded to a **full-dome mirror-dome projection system**, which wraps the visuals all around you, offering a truly immersive 360-degree experience. Plus, its unique "hyposphere" (tilted dome) design means you look forward, just like in a regular cinema, making the show even more comfortable and engaging.

It provides shows in English, Hindi, and Telugu, and its presentations blend scientific knowledge with deeper, spiritual insights. For high school students, a visit here can spark fantastic ideas for science fair projects, deepen understanding of orbits and gravity, and connect lessons from history, art, and mathematics with the vast, beautiful subject of astronomy. It's a place where science, learning, and the human spirit connect.

S&I Article

InnovaTN

Where Young Minds of Tamil Nadu Turn Ideas into Impact

By Swagata Sarkar, Arunima Thappa & Suman Pandit

India today stands at a remarkable moment in its innovation journey. As the nation advances toward the vision of Viksit Bharat 2047, the emphasis on nurturing scientific temperament and creativity at the school level has never been stronger. As Prime Minister Narendra Modi emphasises, "Young innovators of India will drive our journey from developing to a developed nation." With this belief at its core, India is shaping a generation driven by purpose, curiosity, and a problem-solving mindset. In this larger national mission, state-level innovation movements like InnovaTN are becoming powerful catalysts in elevating India's innovation rank and preparing young minds for a future defined by ingenuity.

On a pleasant Saturday morning in Chennai, the campus of Sri Sairam Engineering College was alive with excitement. The air buzzed with creativity, curiosity, and a stir of visionary Ideas. In every corner, students adjusted circuits, tested sensors, and refined prototypes that could one day change lives. This was InnovaTN 2025, Tamil Nadu's State-level Atal Tinkering Lab Hackathon; it was the celebration of imagination and a glimpse of the future of Tamil Nadu and India's innovation journey from the lens of school students.

Organised by the Atal Innovation Mission (AIM), NITI Aayog, in collaboration with Sri Sairam Engineering College, InnovaTN 2025 brought together more than 500 student teams from the nooks and corners of every district of Tamil Nadu. What united these young innovators was a single dream - to use science, technology, and creativity to build solutions for a better tomorrow.

At the heart of InnovaTN lies the spirit of the Atal Tinkering Labs, the flagship initiative of AIM, NITI Aayog. These labs are dynamic makerspaces where students from Classes 6 to 12 learn through hands-on exploration. They build, test, and innovate using robotics kits, sensors, 3D printers, and coding tools, transforming ideas into reality.

Tamil Nadu today has 975 ATLs, each a hub of curiosity and creativity. Together, they form part of India's massive Innovation Movement, now reaching lakhs of students across the country.

The aim is to nurture a future-ready generation equipped with new-age skills, preparing them to become future entrepreneurs, scientists, and innovators; building capabilities to make them the job creators of tomorrow, a shift from being job seekers.

As India works toward its vision of Viksit Bharat by 2047, these young innovators are becoming the driving force behind a new kind of learning: one that values curiosity and uses that curiosity to purposefully solve emerging and existing problems. Among the hundreds of projects that dazzled the jury at InnovaTN, two innovations from Amrita Vidyalayam, Trichy, captured hearts for their creativity and compassion.

Among the top innovations at InnovaTN was VAYURA, the Asthma Relief Belt, created by Class 9 students S. Sreevanth, B. Jaivant, and S. Sai Sujan. It is a smart wearable device designed to help asthma patients breathe easily during cold weather. By providing gentle warmth around the chest, it relieves wheezing and ensures comfort. Stylish, safe, and effective, VAYURA is not just a student project – it's a ready-to-use product with genuine social impact, advancing Sustainable Development Goal 3 of Good Health and Well-being.

Another exciting project was Krishi Sashtra in the Artificial Intelligence domain, designed by Krithik Nair, Gautham V., and Gowshin Raj S. (all Grade 8 students). Krishi Sastra identifies the struggles that farmers face due to unpredictable soil health, pest attacks, and weather changes. Their AI-powered farming system analyses soil, temperature, and humidity through sensors, predicts issues in advance, and alerts farmers via an app with real-time solutions. The system automates irrigation, fertilisation, and pest control to ensure higher yield and lower costs. Their vision is to empower both traditional and new-age farmers with technology-driven precision farming to make agriculture smart, efficient, and profitable.

The success of InnovaTN and Tamil Nadu's innovation movement is not a matter of chance; it is the result of a strong, supportive ecosystem built by NGO partners, AIM's Mentors of Change, Incubation Centres, and the Entrepreneurship Development and Innovation Institute (EDII) Tamil Nadu. Thanks to this synergy, Tamil Nadu today boasts an innovation ecosystem valued at over $28 billion, supported by more than 120 incubators and growing at over 20 percent annually. Chennai, in particular, has emerged as one of Asia's leading startup hubs, demonstrating how education, innovation, and enterprise can come together to transform lives.

As Dr. A.P.J. Abdul Kalam once said, "Creativity leads to thinking, thinking leads to knowledge, and knowledge makes you great." These collaborations ensure that innovations born in classrooms continue their journey into society, creating meaningful impact.

What makes InnovaTN special is not just the innovations, prototypes, or prizes - it's the mindset and attitude it cultivates. Every participating student learns the power of teamwork, design thinking, and resilience.

Every teacher learns how to nurture curiosity and recognises that innovation can begin anywhere, even in a small school lab. Most importantly, it brings together a community united by the belief that young minds can shape a better world.

The journey of InnovaTN itself tells a story of growth. The first edition in Thottukodu saw around 80 teams. The second edition in Erode continued the momentum with 200 teams. And now, with over 502 teams in Chennai, the hackathon stands as a symbol of Tamil Nadu's unstoppable innovation spirit.

At the national level, the movement is gaining greater momentum. As announced in the Union Budget 2025, the Government of India plans to expand the ATL network to 50,000 schools, meaning one in every three schools across India could soon have a makerspace dedicated to tinkering, experimenting, and inventing. Imagine millions of children across India designing prototypes, testing ideas, and learning how to build upon their innovative ideas- transforming their dreams into reality. This is the foundation of an innovation-driven Viksit Bharat by 2047.

As the lights dimmed on the final day of InnovaTN 2025, the sight was unforgettable - young innovators proudly holding their creations, surrounded by teachers and mentors who believed in them. The event was not merely a competition; it was a mirror reflecting India's future: creative, confident, and compassionate.

InnovaTN hence gave us concrete evidence that by giving every child the space to imagine, innovate, & implement, India is actively shaping its future as a global innovation leader, one student at a time. These rising innovators will author the nation's next chapters - a future fueled by imagination, anchored in innovation, and propelled by the limitless potential of our children.

Indian Scientist

Phoolan Prasad

(BORN IN JAN 1, 1944)

When we look at the world of mathematics, some names shine brightly even though they work quietly behind the scenes. Phoolan Prasad is one such name—a brilliant Indian mathematician whose work in the field of nonlinear waves and partial differential equations quietly underpins many of the engineering, physics and environmental systems we rely on today. His contributions show how deep theory can shape practical understanding.

Curiosity from the Village to the University

Phoolan Prasad was born in the village of Khejuri in Ballia district, Uttar Pradesh, in 1944. From modest beginnings, he moved into the world of higher mathematics through perseverance and discipline, earning honours at Calcutta University before completing his PhD at the Indian Institute of Science (IISc), Bengaluru. His journey reflects the power of education to transform lives.

Exploring Waves and Equations

What makes Phoolan Prasad special is how he took abstract mathematical ideas and made them useful. He specialised in partial differential equations and fluid mechanics, tackling how waves move, bend, interact and evolve in complex media, including fluids and layered materials found in nature and industry.

In 1983, his work was honoured with India's prestigious Shanti Swarup Bhatnagar Prize in the mathematical sciences category, where the citation noted his proof of a new type of wave at a liquid-mixture interface—a result that advanced both theory and application.

Teacher and Builder of Minds

At IISc, Phoolan Prasad served as Professor, held the distinguished MSIL Chair, and was Chairman of the Mathematics Department.

Inspiring Young Learners

For students today, Prasad's journey offers a strong message: great science often begins with wonder, persistence, and the courage to tackle what looks difficult. Whether you are solving a tough physics problem or modelling a real-world flow system, you stand on the shoulders of thinkers like Phoolan Prasad.

Why He Matters

Though his work may not appear in flashy headlines, it underlies vital technologies in fluid dynamics, acoustics, wave propagation and more. Phoolan Prasad's scholarship reminds us that mathematics is not a separate world—it's a key tool for understanding nature, our planet, and the challenges we face.

Area of Regular Polygons

Vishnupriya P
10th Class

This project demonstrates a simple and effective method to find the area of a regular polygon using trigonometry. The steps begin by drawing a regular polygon—a shape where all sides and angles are equal. Next, we draw the angle bisectors from the centre to each vertex, which divides the polygon into equal triangles. The number of triangles formed is equal to the number of sides of the polygon, and each triangle has equal area.

To find the area of the polygon, we first calculate the area of one of these congruent triangles using the tangent ratio from trigonometry. Then, by multiplying the area of one triangle by the number of sides, we obtain the total area of the polygon.

This method can be generalised for a regular polygon with 'n' sides, giving us a common formula for calculating the area:

Area=n/4.a2.cot(180/n)

where a ' is the length of one side, and ‘n’ is the number of sides.

(Source: INSPIRE MANAK NLEPC 2014 Booklet)

Anti-Storm Umbrella

Aksha developed an umbrella designed to withstand storms, heavy rain, and harsh weather conditions. She observed that during high wind speeds, traditional umbrellas often get inverted, and it becomes difficult to hold an umbrella while riding a vehicle.

Aksha Dayal
10th Class

To solve this problem, she redesigned the umbrella by altering its shape and varying the lengths of the spokes.

Shorter spokes are positioned in the direction of motion, and their special aerodynamic design allows air to flow over and under the umbrella at nearly equal speeds, reducing the pressure difference and preventing inversion. The Anti-Storm Umbrella can be used easily in windy, rainy, or dusty conditions and can even be mounted on a bicycle handle.

(Source: INSPIRE MANAK NLEPC 2017 Booklet)

Department of Biotechnology (DBT)

Have you ever wondered how vaccines are made, how crops become disease-resistant, or how scientists create medicines that heal our bodies? Behind many such innovations in India stands the Department of Biotechnology (DBT), a powerhouse of life sciences research that connects biology with technology to solve real-world problems.

Birth of a New Science

It was established in 1986 under the Ministry of Science and Technology, Government of India. Its goal is to use biological knowledge to improve human health, agriculture, the environment, and industry. Biotechnology, in simple terms, means using living systems (like cells, plants, and microorganisms) to create useful products. From vaccines and biofertilizers to genetic research, DBT supports hundreds of scientists across India to make life better through biology.

From Labs to Farms and Hospitals

The DBT's work touches almost every aspect of life. In healthcare, it supports the development of affordable vaccines, diagnostic kits, and cancer therapies. During the COVID-19 pandemic, DBT-backed research played a vital role in developing vaccines and testing technologies in record time.

In agriculture, the department promotes research on genetically improved crops that can withstand drought, pests, and diseases, ensuring food security for millions. It also encourages the use of biofertilizers and biopesticides, reducing the need for harmful chemicals and helping farmers protect the soil.

In the environment sector, DBT works on using microbes to clean up pollution, a process known as bioremediation.

Nurturing Young Scientists

The Department of Biotechnology doesn't just fund research — it builds future scientists. Through programs like the Biotechnology Ignition Grant (BIG) and Star College Scheme, it supports students, researchers, and start-ups to bring new ideas to life. Many young innovators have launched biotechnology-based solutions through DBT's initiatives, proving that science can be both creative and impactful.

Building a Healthier Tomorrow

Biotechnology is one of the fastest-growing fields in the world, and India's Department of Biotechnology ensures that this growth benefits everyone. Blending life sciences with innovation, it helps farmers grow better crops, doctors save more lives, and industries go green.

For young scientists, DBT's story is an inspiring reminder that science isn't just about understanding life; it's about improving it. Every test tube, petri dish, and microscope under DBT's guidance holds the promise of a healthier, smarter, and more sustainable India.

The Decimal System

Imagine trying to multiply 478×23 using Roman numerals (like XLXXVIII×XXIII). Sounds like a nightmare, right? Or how about calculating the size of the latest smartphone storage, 256 GB, without a simple way to represent that huge number?

Thankfully, we don't have to! We owe the ease of modern mathematics, science, and technology to one of the most brilliant and fundamental inventions in human history: **the Decimal System.** And its roots trace directly back to ancient India. This isn't just an invention; it's the invisible backbone of the entire digital world you live in!

What is the Decimal System?

At its heart, the Decimal System, or the **Base-10 system,** is simply a way of counting that uses **ten unique digits:** 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. "Wait, only ten digits?" you might ask. "How do we write numbers like 100 or 5,000,000?"

The magic lies in its three key features, all pioneered or formalized using the system developed in India:

1. The Principle of Place Value

In a place-value system, the position of a digit in a number determines its value. Moving a digit one place to the left increases its value tenfold. Let's look at the number **777:**

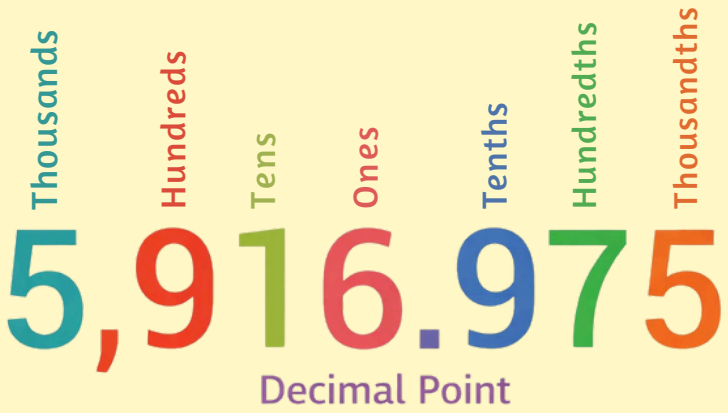
- The first **7** (on the right) means 7×1 (Seven units).
- The second **7** means 7×10 (Seventy).
- The third **7** (on the left) means 7×100 (Seven hundred).

If this system didn't exist, you'd need a separate symbol for every single power of ten, making arithmetic impossible!

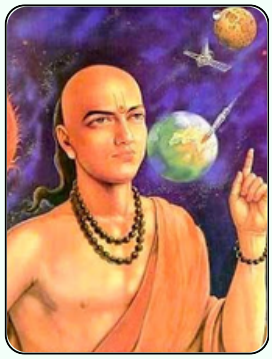
2. The Mighty Zero (0)

The most profound contribution of Indian mathematics is undoubtedly the invention and definition of zero (called Shunya in Sanskrit). Zero is a number that represents the absence of quantity, and it is also a critical placeholder.

This concept was refined by India's mathematical giants! Aryabhata (5th century CE) first used a system that clearly employed zero as a placeholder to manage the large numbers needed for astronomy.



Later, the brilliant **Brahmagupta** (7th century CE) formally defined the rules for arithmetic involving zero, such as the sum of a number and zero. This established zero as a number with distinct properties, giving rise to modern algebra!



Aryabhatta, Indian Mathematician and Astronomer

Before zero, representing numbers like 101 was incredibly confusing. In the Decimal System, the zero holds the tens place vacant, clearly distinguishing 101 (one hundred and one) from 11 (eleven).

3. The Decimal Point (Fractions and Decimals)

The third key feature is the decimal point, which allows the system to easily handle fractions and parts of a whole number. This expands the place-value principle to the right of the units column.

For example, in the number **4.75:**

- The **4** means **4** units.
- The **7** means **7/10** (Seven tenths).
- The **5** means **5/100** (Five hundredths).

This simple dot allows engineers, scientists, and students like you to handle incredibly precise measurements (like 99.99% purity or 0.001 mm thickness) without using complex fractions.

History: From Bharat to the World

The development of the Decimal System was a slow but steady process in ancient India, driven by the need for advanced astronomy and commerce.

1. Early Evidence (3rd Century BCE): The concept of different symbols for different numbers was present in ancient Indian scripts.

2. The Bakhshali Manuscript (Approx. 3rd-4th Century CE): This birch-bark manuscript, discovered near Peshawar (modern-day Pakistan), is one of the earliest known texts to show a system very close to the modern Decimal System.

3. The Gwalior Inscription (876 CE): This stone inscription in Gwalior, Madhya Pradesh, contains the earliest undisputed, documented use of the modern symbol for **zero (0).** This stone tablet literally marks the spot where zero entered recorded history!

The Global Journey

How did this system travel the world?

- **Arab Traders and Scholars:** Around the 9th century, scholars from the Islamic world, particularly the Persian mathematician Al-Khwarizmi (whose name gave us the word "algorithm"), adopted the Indian numerals. They recognized the system's superiority for computation and documented it extensively. This is why the digits are often called **Hindu-Arabic Numerals.**

- **European Adoption:** Italian mathematician Fibonacci introduced the system to Europe in the 13th century via his book, Liber Abaci. Though it took centuries to replace cumbersome Roman numerals, this shift eventually fueled the Scientific Revolution.

The Role of the Decimal System

Why is this system so important? Its role extends far beyond your homework.

- **Mathematical Foundation:** The place-value system makes complex arithmetic simple. Imagine the impossibility of long division without zero!
- **Scientific Precision:** It allows scientists to represent everything from vast astronomical distances to microscopic measurements with ease.
- **Digital Revolution:** While computers use binary, our interaction with technology relies on the place-value logic established by the Indian system.

Conclusion: Celebrating Indian Mathematical Genius

The Decimal System, with its principle of place value and the revolutionary concept of zero, is arguably the most impactful intellectual contribution India has made to the world. It wasn't just a new way to write numbers; it was a new way to think.

From the ancient astronomical calculations of Aryabhata to the foundational rules defined by Brahmagupta, Indian mathematicians created the ultimate tool for efficiency and precision. This system paved the way for calculus, modern physics, and the entire digital age.

Next time you see a price tag, check the battery percentage on your phone, or solve a tough equation, remember you are using a legacy—the elegant, powerful language of numbers perfected right here in India. It proves that sometimes, the simplest ideas—like having a symbol for 'nothing'—can change everything!

Riddles 2509

1. What can travel around the world while staying in a corner?
2. At night, they come without being fetched, and by day, they are lost without being stolen.
3. What has a neck but no head?
4. The more you have of it, the less you see. What is it?
5. What is always coming but never arrives?

Sudoku Challenge 2509

3	4			6		2		9
2		8	4	9				6
	2		3	1				
		4				1		
				2	5		4	
9				5	1	4		3
4		3		7			6	8

(Answers on Back Cover Inside)

Ministry of Earth Sciences (MoES)

When you look at the clouds, feel the ocean breeze, or watch the rain fall, you are witnessing the work of nature that scientists study every day at the Ministry of Earth Sciences (MoES). This remarkable ministry helps India understand and predict the secrets of our planet, from the depths of the ocean to the heights of the atmosphere.

Understanding the Earth

The Ministry of Earth Sciences (MoES) was established in 2006 to bring together all Earth-related research under one roof. It studies weather, climate, oceans, geophysics, and the atmosphere, helping India prepare for natural events like cyclones, earthquakes, and monsoons. Its scientists combine the power of observation, data, and technology to understand how the Earth works and how we can live more safely with it.

From the Ocean Floor to the Clouds

One of the key organizations under MoES is the India Meteorological Department (IMD), the team behind our weather forecasts. Whether it's predicting rainfall, issuing cyclone warnings, or monitoring heatwaves, IMD's work helps farmers, fishermen, and people across the country stay safe and informed.

Under the sea, the National Institute of Ocean Technology (NIOT) and the National Centre for Polar and Ocean Research (NCPOR) explore India's vast marine and polar regions. Scientists at these institutions study tides, marine life, and undersea minerals. They even develop robots and underwater vehicles to explore the deep sea, an exciting area called deep ocean exploration.

Meanwhile, the Indian National Centre for Ocean Information Services (INCOIS) in Hyderabad provides critical information for fishermen and coastal communities, helping them navigate safely and understand changing sea conditions.

Protecting People and the Planet

MoES scientists play a crucial role in disaster warning systems. They predict cyclones before they strike, study earthquakes to improve safety, and monitor climate change to plan for the future.

The ministry is also leading the Deep Ocean Mission, a groundbreaking initiative that aims to explore deep-sea resources and understand marine biodiversity, a true frontier of science.

The Science of Our Home

The MoES reminds us that science isn't just about stars and atoms, it's also about our home planet. By studying the oceans, the atmosphere, and the land beneath our feet, India's Earth scientists are helping protect our planet and prepare us for the future.

Indian Inventions

Rockets

India's Journey from Battlefield Fire to the Stars!

Ever looked up at a streak of light in the night sky and wondered how we send massive machines into the silent vacuum of space? Welcome to the world of **rocketry!** This isn't just about big engines and loud bangs; it's a story of incredible innovation, and believe it or not, a huge part of that story started right here in India.

What exactly is a Rocket?

Think of a rocket as a high-speed delivery truck for space. Its job is to carry a **payload** - which could be a satellite, a robotic rover, or even humans—high enough and fast enough to break free from Earth's gravity.

How does it work? It's all thanks to **Sir Isaac Newton's Third Law of Motion:** "For every action, there is an equal and opposite reaction."

Imagine blowing up a balloon and letting it go. The air rushes out the back (the action), and the balloon zooms forward (the reaction). A rocket engine does the same thing on a massive scale. It burns fuel and an "oxidizer" (since there's no oxygen in space to help things burn) to create hot, high-pressure gas. This gas is blasted out of a nozzle at the bottom, pushing the rocket toward the heavens at thousands of kilometers per hour!

The Indian Roots: Iron and Fire

While many people think of NASA when they hear "rockets," India's contribution to this field goes back centuries. In the late 1700s, **Hyder Ali** and his son, Tipu Sultan, the rulers of the Kingdom of Mysore, revolutionized warfare.

Before them, rockets were mostly made of bamboo or paper—they weren't very strong and didn't fly far. The Mysore army innovated by using **iron tubes** to hold the gunpowder.

This allowed for much higher pressure, meaning the rockets could travel over 2 kilometers! During the Anglo-Mysore Wars, these "Mysorean Rockets" terrified the British forces. After the wars, the British actually took these Indian designs back to England to study them, which led to the development of modern Congreve rockets. So, in a way, India helped kickstart the global rocket race!

The Global Leap

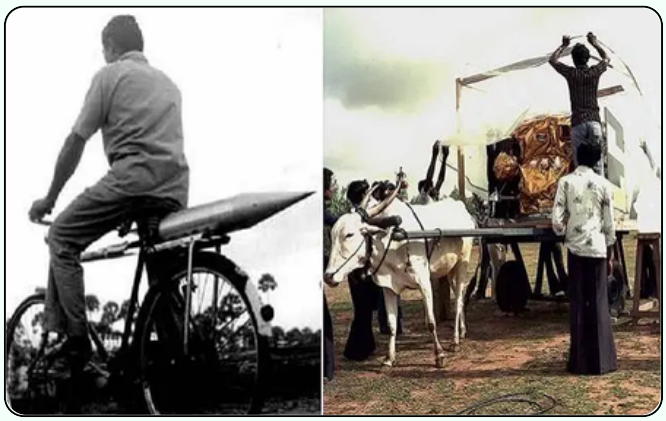
Following the early Indian and British designs, the 20th century saw rocketry evolve from weapons of war into vessels of discovery. Scientists like Robert Goddard and Wernher von Braun began using liquid fuels, which were much more powerful than gunpowder. This culminated in the "Space Race," culminating in the iconic Apollo 11 mission, which put humans on the Moon in 1969. Rocketry became the ultimate test of a nation's scientific muscle.

The Modern Indian Revolution: ISRO's Magic

After independence, India didn't just want to watch from the sidelines. Under the vision of **Dr. Vikram Sarabhai** and **Dr. APJ Abdul Kalam** (the "Missile Man of India"), the Indian Space Research Organisation (ISRO) was born.

The early days were humble—literally! In the 1960s, scientists at Thumba moved rocket parts on **bicycles** and **bullock carts.**

But don't let those modest beginnings fool you. India has since become a global superpower in space through sheer ingenuity.



Our Major Achievements:

1. **The Workhorse (PSLV):** The Polar Satellite Launch Vehicle is like the "reliable SUV" of space. It has launched hundreds of satellites for countries all over the world with incredible precision.
2. **Mangalyaan (Mars Orbiter Mission):** In 2014, India made history by becoming the first nation to reach Mars on its very first attempt! What stunned the world was that ISRO achieved this deep-space feat on an **incredibly small budget**, proving that high-end science doesn't always require unlimited funds—it requires smart engineering.
3. **Chandrayaan Missions:** India's lunar exploration has been historic. Chandrayaan-1 discovered water molecules on the Moon, and in 2023, **Chandrayaan-3** made India the first country to land a spacecraft near the lunar South Pole!
4. **Gaganyaan:** Right now, ISRO is working on sending Indian astronauts into space on our own home-grown rocket.

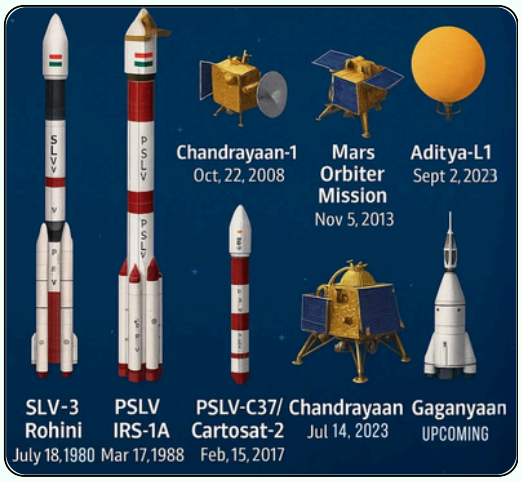
Why does it matter to YOU?

You might think, "Why spend so much on rockets?" Well, every time you use Google Maps, check the weather, or watch a live cricket match, you are using a satellite that a rocket put into orbit. Rockets are the keys to understanding climate change, discovering new minerals, and perhaps one day, finding a second home for humanity among the stars.

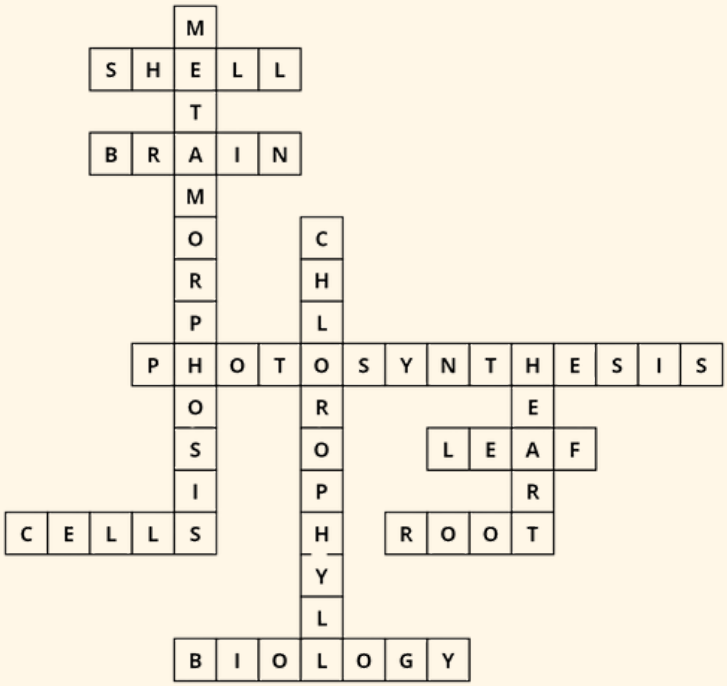
From Mysore to the Moon and Beyond

The journey that began with iron-tube rockets in the Kingdom of Mysore has today reached the South Pole of the Moon and is now preparing to carry Indian astronauts into space. It is a story of courage, curiosity, and continuous learning. India's rocket journey proves that innovation does not depend on wealth alone—it depends on vision, persistence, and belief in one's abilities.

The next chapter of this story is still being written. It may include missions to Mars, Venus, Jupiter, or even beyond our solar system. And that chapter will not be written by history books alone—it will be written by young scientists, engineers, coders, and dreamers like you. So the next time you look up at the night sky, remember: the future of space exploration might just begin in your classroom, your notebook, or your imagination.



Solution
Word Search 2509



Solution
Sudoku Challenge 2509

3	4	7	1	6	8	2	5	9
2	5	8	4	9	7	3	1	6
1	6	9	5	3	2	7	8	4
7	2	6	3	1	4	8	9	5
5	9	4	7	8	6	1	3	2
8	3	1	9	2	5	6	4	7
6	7	5	8	4	3	9	2	1
9	8	2	6	5	1	4	7	3
4	1	3	2	7	9	5	6	8

Riddle 2509 Answer

1. Stamp 2. Stars 3. Bottle 4. Darkness 5. Tomorrow

GYS GURU PURASKAR

Towards Building a Nation of Innovation

Theme: My Thoughts for Education Towards Atmanirbhar Bharat (Self-Reliant India)

Mode: Online Video Submission (5 to 7 Minutes)

Eligibility: Any Working Teacher From KG to PG Can Participate

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