



QUARTERLY ISSUES

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SCIENCE MAGAZINE

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Science In Action

What's new?

New cause of cell ageing

New research could be key to our understanding of how the ageing process works. The findings potentially pave the way for better cancer treatments and revolutionary new drugs that could vastly improve human health in the twilight years.

The research team discovered that in ageing, senescent cells (cells that never divide) stopped producing a class of chemicals called nucleotides, which are the building blocks of DNA. This means that if we could prevent cells from losing nucleotide synthesis, the cells might age more slowly. Senescence is most widely known as the body's protective barrier against cancer. Therefore goal is not to completely prevent senescence, because that might unleash cancer cells but to find a way to remove senescent cells to promote healthy ageing and better function. The human clinical trials are still in early stages, but studies with mice have shown that by eliminating senescent cells, mice age better, with a more productive life span.

Increased control over ions' motions

Researchers have controlled the motion of a trapped ion, an electrically charged atom, better than ever possible before, manipulating the energy level of its oscillation within an electromagnetic field. Using lasers to tweak the ion, the researchers were able to set it oscillating within the electromagnetic field that confined it, with any number of quanta up to 100, breaking previously published records of about 17 quanta.

The team also put the ion in a superposition—a weird situation in which the ion is simultaneously in two energy states at once, making it ultra-sensitive to any stray electromagnetic fields.

Scientists' newly demonstrated prowess with ions could also be used to build better quantum computers.

"It's an unprecedented level of control," says Katie McCormick, a physicist at the University of Washington in Seattle. "We've

generated quantum states at a level that nobody has before."

Motorized prosthetic arm can sense touch

Biomedical engineers are helping develop a prosthetic arm for amputees that can move with the person's thoughts and feel the sensation of touch via an array of electrodes implanted in the muscles of the patient

The team, led by University of Utah biomedical engineering associate professor Gregory Clark, has developed a way for the "LUKE Arm" (so named after the robotic hand that Luke Skywalker got in "The Empire Strikes Back") to mimic the way a human hand feels objects by sending the appropriate signals to the brain. That means an amputee wearing the prosthetic arm can sense the touch of something soft or hard, understand better how to pick it up, and perform delicate tasks that would otherwise be impossible with a standard prosthetic with metal hooks or claws for hands.

Chandrayaan 2

One of India's most ambitious space-based mission, Chandrayaan-2, took flight on 22nd July 2019. The brainchild of Indian Space Research Organisation (ISRO), the mission will attempt to explore the south polar region of the Moon.

The primary objectives of Chandrayaan-2 are to demonstrate the ability to soft-land on the lunar surface and operate a robotic rover on the surface. Scientific goals include studies of lunar topography, mineralogy, elemental abundance, the lunar exosphere, and signatures of hydroxyl and water ice. The orbiter will map the lunar surface and help to prepare 3D maps of it. The onboard radar will also map the surface while studying the water ice in the south polar region and thickness of the lunar regolith on the surface. Chandrayaan-2 will inform the location and abundance of lunar water for



exploitation by the future lunar base proposed by the Artemis program. The main scientific objective is to map the location and abundance of lunar water.

The orbiter will orbit the Moon at an altitude of 100 km (62 mi). The orbiter carries five scientific instruments. Three of them are new, while two others are improved versions of those flown

on Chandrayaan-1. The approximate launch mass will be 2,379 kg (5,245 lb). The Orbiter High Resolution Camera (OHRC) will conduct high-resolution observations of the landing site prior to separation of the lander from the orbiter. The orbiter's structure was manufactured by Hindustan Aeronautics Limited and delivered to ISRO Satellite Centre on 22 June 2015.

The list below lists most key scientists and engineers who were instrumental to the development and launch of Chandrayaan-2 project:

- Muthaya Vanitha - Project Director, Chandrayaan-2
- Ritu Karidhal - Mission Director, Chandrayaan-2
- Chandrakanta Kumar - Deputy Project Director, Chandrayaan-2

- Srinjoy Majumdar (IB-1)

ELON MUSK



Elon Musk, is THE tech mogul of the 21st Century. He is the founder of SpaceX - a space exploration company, and co-founder of Tesla – an automobile producer focusing on electric and autonomous cars, Paypal – an online transaction business, and many other interesting corporations like The Boring Company – a tunnel boring company that aims to create a network of tunnels for faster transportation in the United States , and Neuralink – a corporation developing brain-machine interfaces that allows information flow between the brain and a computer!

SpaceX's mission is to enable humans to become a spacefaring civilization and a multi-planet species by building a self-sustaining city on Mars. In 2008, SpaceX's Falcon 1 became the first privately developed liquid-fuel launch vehicle to orbit the Earth.

Born in 1971, in South Africa, he developed an interest for coding at age 10, and by age 12 sold his own video game to a magazine. At the age of 17 he shifted to Canada against his father's will and graduated with a degree in Economics and Physics. He also entered Stanford University for a PhD in energy physics, but left after 2 days to start his own company.

After a bumpy ride of success and failure he is now the most renowned and revolutionary inventor and aims to solve the global warming problem, and prevent human extinction by establishing a human colony on Mars! While these ideas may not seem practical, if there is anyone who can do this, its **Elon Musk**.

-Vikhyaat Agarwal (Class 10)

QUANTUM ENTANGLEMENT



Scientists just captured the first-ever photo of the phenomenon dubbed "spooky action at a distance" by Albert Einstein. That phenomenon, called quantum entanglement, describes a situation where particles can remain connected such that the physical properties of one will affect the other, no matter the distance (even miles) between them.

Einstein hated the idea, since it violated classical descriptions of the world. So he proposed one way that entanglement could coexist with classical physics—if there existed an unknown, "hidden" variable that acted as a messenger between the pair of entangled particles, keeping their fates entwined.

There was just one problem: There was no way to test whether Einstein's view—or the stranger alternative, in which particles "communicate" faster than the speed of light and particles have no objective state until they are observed—was true. Finally, in the 1960s, physicist Sir John Bell came up with a test that disproves the existence of these hidden variables—which would mean that the quantum world is extremely weird.

Recently, a group at the University of Glasgow used a sophisticated system of lasers and crystals to capture the first-ever photo of quantum entanglement violating one of what's now known as "Bell's inequalities."

This is "the pivotal test of quantum entanglement," said senior author Miles Padgett, who holds the Kelvin Chair of Natural Philosophy and is a professor of physics and astronomy at the University of Glasgow in Scotland. Though people have been using quantum entanglement and Bell's inequalities in applications such as quantum computing and cryptography, "this is the first time anyone has used a camera to confirm it."

To take the photo, Padgett and his team first had to entangle photons, or light particles, using a tried-and-true method. They hit a crystal with an ultraviolet (UV) laser, and some of those photons from the laser broke apart into two photons. "Due to conservation of both energy and momentum, each resulting pair of photons are entangled," Padgett said.

They found that the entangled pairs were correlated, or in sync, far more frequently than you would expect if a hidden variable were involved. In other words, this pair

violated Bell's inequalities. The researchers snapped a picture using a special camera that could detect individual photons, but only took a photo when a photon arrived with its entangled partner.

Now, Padgett and his team are working to improve the imaging performance of the microscope.

-Sanurag Basu (A2)

Artificial Intelligence in Agriculture

The field of agriculture gives a lot of opportunities for the use of artificial intelligence (AI). The current world population is 7 billion. By 2050, the population would have risen to 10 billion. Food security has to be ensured for this huge population. Therefore, day by day, the importance of precision and accuracy in agriculture is increasing at a rapid rate. There is no space for mistakes. This is where artificial intelligence comes into use.

AI has been used for innumerable purposes in recent years. But its most important use has been in agriculture. To put it simply, AI is something wherein we substitute technology for some of the factors of production in agriculture without compromising on efficiency. With its introduction, work has become less pressurising and a lot more time efficient for farmers. For example, a technique known as transfer learning uses AI to identify crop diseases with better accuracy. The core tool is to use AI algorithm to train computers to say identify a disease. In Tanzania this technique used 2756 images for this purpose and the identification of disease has been possible with an accuracy of 98 percent!

The use of AI in agriculture can be broadly divided into three categories:

1. **Agricultural robots:** These robots have been designed to handle the most essential agricultural tasks such as harvesting. This is useful where finding labour is cumbersome.
2. **Crop or Soil Monitoring:** Computers use over a thousand algorithms programmed into them, to understand the data sent to



them through drones or sensors. This data is then used to monitor the condition and health of the crop and the soil.

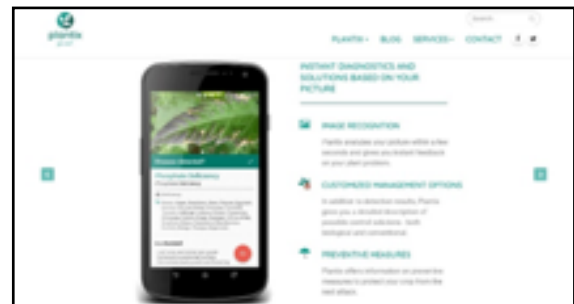
3. **Predictive Analytics:** Machines are able to determine the impact of several environmental changes on crop productivity.

Agricultural robots:

Weed control is one of the main concerns for a farmer. This is one of the main factors which determine whether the cropping season will be a success or not. To prevent this problem, farmers have turned to robots for assistance. A robot, called See and Spray, which has been gaining rapid popularity, provides the best solution to this issue. As the name suggests, this robot continuously takes pictures of the crops, exactly identifying the position of the weed, and then is able to spray the herbicide onto the weed. Robots have also been successfully used for picking up strawberries in California and Arizona.

Crop or soil monitoring:

Tech-start up, PEAT, has developed an application called PLANTIX that has the ability to identify defects and nutritional deficiencies in the soil. The app heavily relies on the pictures taken by the camera, which is compared to the image to the image previously stored in its server. A health diagnosis of the deficiency is then printed out.



This is how AI is used to diagnose the deficiencies of plants. Companies such as, Farmshots, captures images of plants through satellites and then sends it back for analysis. The software, then can detect potential diseases, pests, and the required amount of nutrition.

Predictive analysis:

Many tech companies are investing in algorithms which are proving very useful in prediction analysis. A Georgia based start-up has designed 'Agvoice' which uses natural language kits for field notes and does yield prediction using satellite imageries.

Conclusion

AI has great potential in the field of agriculture. It has replaced humans on many levels of difficulty. But the question still remains: will it be able to surpass the intuition and knowledge that farmers have? The answer is probably 'No'.

However, there is no doubt that it will complement and supplement the effort of feeding the burgeoning population on earth.

-Advay Mishra (AS)

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EVENTS AND ACTIVITIES

- An annual intra-school Science Fest could be organised with activities such as debates on science related topics, quizzes, model making, essay writing and poster making.
- A school-wide Science Fair could be planned where students of all classes could present projects on concepts they have learnt throughout the academic year to guests. This would help students understand and incorporate concepts they learn in class to their use and importance in daily life.
- Notable speakers who have excelled in their respective scientific fields could visit the schools to speak about exciting topics and show "science in action". This could also be an opportunity for students to learn about careers in science
- A science corner could be maintained for displaying science news and fun facts to engage students of all classes
- Important days around the year that are important milestones in our quest for scientific discovery could be acknowledged and celebrated. This includes celebrating the science days, birthdays of eminent scientists and monumental events that changed our course of history.
- Visits to scientific institutions could be conducted to broaden the horizons of the members of the club. These include science museums and water treatment plants.
- Maintain a social media presence to reach a wider range of people

