

# SCIENCE CENTRE NEWS LETTER

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## SCIENCE CENTRE

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### WHAT'S NEW IN SCIENCE?

#### Universal brain-computer interface makes people able to play games with just their thoughts

The Researchers at the University of Texas, Austin, United States had created a Brain-Computer Interface (BCI) to help improve the lives of people with motor disabilities (a problem in the movement of any of person's body parts)

Typically, this type of device requires extensive calibration for each user - brain of every person is different - and that is why it is difficult to mainstream adoption. This new solution can quickly understand the needs of individual participants and self-calibrate through repetition. That means multiple patients could use the device without needing to tune it to the individual. The research on the calibration-free interface is published in Journal PNAS Nexus (Proceedings of the National Academy of Sciences), Oxford University Press, England.

The participants wore a cap packed with electrodes that are hooked up to a computer. The electrodes gather data by measuring electrical signals from brain, the decoder interprets that information and translates it into game action which helps users guide and strengthen their neural plasticity, the ability of the brain to change, grow and recognize over time.

These experiments are designed to improve brain

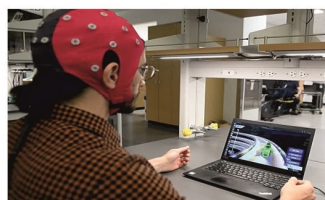
function for patients and use the devices controlled by Brain-Computer Interfaces to make their lives easier. In this case, the actions are two folded: the car racing game and a simpler task of balancing the left and right sides of a digital bar. The experts developed a "decoder" for the simpler bar

task that makes it possible for the interface to translate brain waves into commands. The decoder serves as a base for the other users which is the key to avoiding the long calibration process.

The decoder worked well enough that participants trained simultaneously for the bar game and the more complicated car racing game, which required thinking several steps ahead to make turns.

"We want to translate the BCI to the clinical realm to help people with disabilities. On the other hand, we need to improve technology to make it easier to use so that the impact for these people with disabilities is stronger." said Del R. Milan, Professor, Cockrell School of Engineering Chandra Family Department of Electrical and Computer Engineering and Dell Medical School's Department of Neurology.

**Courtesy: Main Author/Source:** University of Texas, Austin, United States in Science daily.com



### SCIENTIST OF THE MONTH

#### Dr. K. George Thomas

Dr. Kakkudiyi George Thomas was born on 13<sup>th</sup> May 1961 in Kerala. He completed Master's degree in Chemistry in 1983 from Savitribai Phule Pune University, Pune. He returned to Kerala for Doctoral studies under the guidance of Dr. K. Saramma and secure a Ph.D degree from University of Kerala in 1989. He completed Post-Doctoral studies from the National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram in 1994.

The research of Dr. Thomas has been focused on photoresponsive nanomaterials (materials of which a single unit is sized between 1 to 100nm). He also worked on self-organization of molecules on surfaces

and has developed methodologies for modulating molecular organization through the introduction of functional groups [it is a substituent (one or group of atoms that replaces one or more atoms) or moiety in a molecules characteristic chemical reactions]. He developed a number of near-infrared absorbing sensitizer (it is a chemical compound that is capable of light emission after it receive energy from a molecule) which are relevant in biological imaging and optical data storage applications.

Dr. Thomas received the Bronze Medal of the Chemical Research Society of India in 2004 and the Council of Scientific and Industrial Research awarded him the Shanti Swarup Bahatnagar Prize in 2006. He became a fellow of the Indian National Science Academy in 2015.



**Courtesy: Main Author/Source:** wikipedia.org/wiki/K.\_George\_Thomas



### Timings

Tuesday to Sunday  
& Public Holidays

9.30 am to 4.30 pm

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बहुजनहिताय बहुजनसुखाय

## SCIENCE FACTS MAY 2024

1 May 1851	The Great Exhibition is opened in London by Queen Victoria.
1 May 1930	The Planet Pluto is officially named.
3 May	International Energy Day.
3 May 1892	English Physicist George Paget Thomson ( Recognised for discovery of the wave properties of the electron by electron diffraction ) was born.
3 May 1902	French Physicist Alfred Kastler ( Won the Nobel Prize in Physics in 1966 for the discovery and development of optical methods for studying Hertzian Resonance in atoms ) was born.
5 May 1921	American Physicist Arthur Leonard Schawlow ( Co- inventor of the LASER) was born.
5 May 1961	The first piloted Mercury space craft "Freedom – 7" launched by America.
6 May 1871	French Chemist Victor Grignard (Discoverer of the Grignard Reagent and Grignard Reaction) was born.
6 May 1929	American Chemist Paul Lauterbur ( Worked to made the development of Magnetic Resonance Imaging MRI possible ) was born.
7 May 1939	Canadian born Molecular Biologist Sidney Altman ( Worked on the catalytic properties of RNA ) was born.
8 May 1902	French Microbiologist Andre Michael Lwoff (Co-winner of the 1965 Nobel Prize in Physiology or Medicine for their discoveries concerning genetic control of enzyme and virus synthesis) was born.
11 May 1998	India conducted nuclear tests at the Pokhran range in Rajasthan Desert.
13 May 1857	Sir Ronald Ross (Inventor of medicine for Malaria) was born.
15 May 1859	French Physicist Pierre Curie ( A pioneer in Crystallography, Magnetism, Piezoelectricity and Radioactivity ) was born.
17 May 1749	Sir Edward Anthony Jenner (Inventor of smallpox vaccine) was born.
18 May	World AIDS Vaccine Day.
18 May	International Museum Day.
19 May 1910	Halley's Comet brushes the Earth with its tail.
19 May 1971	Soviet Union had sent "Mars-2" for journey to Planet Mars which was crashed at Mars's Land on 27 Nov,1971.
21 May 1860	Dutch Inventor William Einthoven ( Inventor of the first practical electrocardiograph ECG ) was born.
25 May 1865	Dutch Physicist Pieter Zeeman (Co-winner of the 1902 Nobel Prize in Physics for his discovery of the Zeeman effect) was born.
30 May 1971	America launched space craft "Mariner – 9" to Planet.
31 May	World No Tobacco Day (by U.N.).

U. N. : United Nations

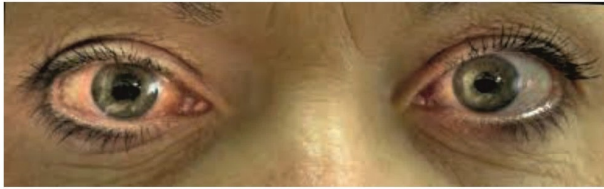
WHO -World Health Organization

UNESCO - United Nations Educational Scientific & Cultural Organization

Answers: 1) d, 2) c, 3) c, 4) b, 5) b, 6) a, 7) a

## SCIENTIFIC QUESTION

### Glaucoma



Glaucoma is a group of eye diseases that lead to damage of the optic nerve, which transmits visual information from the eye to the brain. Glaucoma may cause vision loss if left untreated. It has been called the "silent thief of sight" because the loss of vision usually occurs slowly over a long period of time. A major risk factor for glaucoma is increased pressure within the eye, known as intraocular pressure (IOP). It is associated with old age, a family history of glaucoma, and certain medical conditions or medications. The word glaucoma comes from the Ancient Greek word *glaukós*, meaning 'gleaming, blue-green, gray'.

There are different types of glaucoma, but the most common are called open-angle glaucoma and closed-angle glaucoma. Inside the eye, a liquid called aqueous humor (it is transparent water like fluid similar to blood plasma) helps to maintain shape and provides nutrients. The aqueous humor normally drains through the trabecular meshwork (it is an area of tissue in the eye located around the base of the cornea). In open-angle glaucoma, the draining is impeded, causing the liquid to accumulate and pressure inside the eye to increase. This elevated pressure can damage the optic nerve. In closed-angle glaucoma, the drainage of the eye becomes suddenly blocked, leading to a rapid increase in intraocular pressure. This may lead to intense eye pain, blurred vision and nausea.

**Signs and symptoms:** Open angle glaucoma usually presents with no symptoms early in the course of the disease. However, it may gradually progress to involve difficulties with vision. It usually involves deficits in the peripheral vision (is a vision occurs outside the point of fixation) followed by central vision loss as the disease progresses.



**Acute angle closure glaucoma** is a medical emergency due to which the risk of impending permanent vision loss, is characterized by sudden ocular pain, seeing halos around lights, red eye, very high intraocular pressure, nausea and vomiting and suddenly decreased vision.

**Risk factors:** Glaucoma can affect anyone, some risk factors includes following:

**1) Ocular hypertension:** Ocular hypertension (increased pressure within the eye) is the most important risk factor for glaucoma, but only about 50% of people with primary open-angle glaucoma actually have elevated ocular pressure.

**2) Family history and genetics:** Positive family history is a risk factor for glaucoma. The relative risk of having primary open-angle glaucoma is increased about two- to four-fold for people who have a sibling with glaucoma.

Additionally, there are some rare genetic conditions that increase the risk of glaucoma, such a - Axenfeld-Rieger syndrome [it is a rare autosomal (chromosome) dominant disorder, which affects the development of the teeth, eyes and abdominal region] and primary congenital glaucoma.

**3) Ethnicity:** Many people of East Asian descent are prone to developing angle closure glaucoma because of shallower anterior chamber depths in eyes.

**4) Diet:** Caffeine increases intraocular pressure in those with glaucoma.

**5) Other:** Other factors can cause glaucoma, known as "Secondary glaucoma" including prolonged use of steroids, conditions that severally restrict blood flow such as severe diabetic retinopathy and central retinal vein occlusion and uveitic glaucoma (is a progression stage of noninfectious anterior pigmented layer of the eye).

**Diagnosis:** Diagnosis for glaucoma is an integral part of a standard eye examination performed by optometrists and ophthalmologists. The baseline glaucoma evaluation tests include intraocular pressure measurement by using tonometry (it is the procedure eye care professional perform to determine the intraocular pressure (IOP), the fluid pressure inside the eye), anterior chamber angle assessment by optical coherence tomography and inspecting the drainage angle (gonioscopy).

**Treatment:** The modern goal of glaucoma management is to decrease the intraocular pressure (IOP), thus slowing the progression of glaucoma and preserving the quality of life for patients, with minimal side-effects.

The IOP should be reduced to a target level at which the disease progression is controlled protecting the visual field and improving life quality. The target level is set individually depending on multiple factors including the pretreatment IOP, the severity and rate of the disease progression and the side effects of the medications. In general, the target IOP is equal or lower than 18mmHg in mild, 15mmHg in moderate and 12mmHg in severe stage glaucoma. After setting the target IOP, regular follow-up should be done assessing the IOP and the disease progression.

• **Medication:** There are several pressure-lowering medication groups that could be used in lowering the IOP, usually eyedrops. The choice of medication usually depends on the dose, duration and the side effects of each medication.



• **Adherence:** Poor compliance with medications and follow-up visits is a major reason for treatment failure and disease progression in glaucoma patients.

• **Laser:** Argon laser trabeculoplasty (ALT) may be used to treat open-angle glaucoma. Nd:YAG laser peripheral iridotomy (LPI) may be used in patients susceptible to or affected by angle closure glaucoma.

• **Surgery:** Both laser and conventional surgeries are performed to treat glaucoma. Surgery is the primary therapy for those with congenital glaucoma. Generally, these operations are a temporary solution, as there is not yet a cure for glaucoma.

**Courtesy: Main Author/Source:** [en.m.wikipedia.org/wiki/Glaucoma](http://en.m.wikipedia.org/wiki/Glaucoma)

## KNOW THE EXHIBIT

### Your Weight Varies

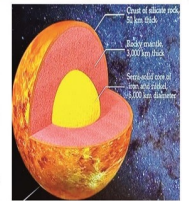
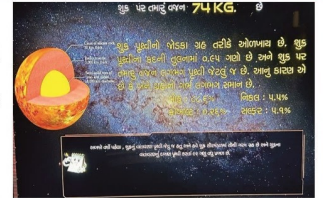
Venus is also known as the sister planet of Earth. Venus is 0.95 times smaller compare to the size of Earth and person's weight on Venus is almost same as on Earth. This is because core of both the planets are almost the same. The planet Venus contains following metals:

Iron 88.6%, Nickel 5.5%, Cobalt 0.26%, Sulfur 5.1%

Early civilisations thought Venus was two different bodies called Phosphorus and Hesperus by the Greeks and Lucifer and Vesper by Romans. Mayan astronomers made detailed observations of Venus in early 650 AD (Anno Domini). Venus is the second brightest object in the night sky after Moon. Venus is so bright that it can be seen during daytime on a clear day. Venus rotates in the opposite direction to most other planets. This means that Venus is rotating in the opposite direction to the Sun, this is also known as a retrograde rotation.

Billions of years ago, the climate of Venus was similar to that of Earth and now Venus is the hottest planet in solar system and atmospheric pressure of Venus is 92 times stronger than Earth's atmosphere. Both Russia and USA (United States of America) lost control to their probes in their first mission to Venus. The "Venera 1" space probe was launched in 1961 by Russia but lost contact with base. USA also lost their first probe "Mariner 1" to Venus, although "Mariner 2" was able to take measurements of the planet in 1962. The Soviet Union's "Venera 3" was the first man-made space craft to land on Venus in 1966.

This exhibit is situated at "Entering Space Gallery" between Fun Science Gallery and Power of Play Gallery at the first floor of Science Centre.



## SCIENCE PROJECT

Surat Municipal Corporation had organized 'Science Fair-2023' at Art Gallery, Science Centre Surat on 18th and 19th August, 2023 for the students of std. 8 to 12. Samrat Ashok Primary School No.-303 School had participated in the Science Fair with their project on 'A field guard in a Farmer's house' under the sub theme of 'Good Health and Wellbeing'.

The aim of the project is to harvest organic crops from the farm using home-made pesticides.

**Introduction:** In 21<sup>st</sup> Century, the population of the World is increasing rapidly. The demand for food is also increasing. To meet this demand rapidly, chemical fertilizers and pesticides are being used in the farm. Due to which soil quality and fertility deteriorates. Eating such crop also affects human health.

**Resources:** 15 days old butter milk, mustard, water, spray bottle

**Working method:** 15 days old butter milk is taken in a vessel, a Copper pot is placed in it and mustard powder is put in it. After closing the container and keeping it in the shade for 5 days, 100 litre of water is added to this pesticide and sprinkled in the farm.

**Chemical process:** 1) A chemical reaction between butter milk and copper forms a toxic salt. This destroys insects, caterpillar and fungi in the crops. 2) Mustard powder contains a large amount of Sulphur, which is chemically treated with Copper to form copper sulphate ( $\text{CuSO}_4$ ). Copper sulphate is widely used as an insecticide and fungicide.

**Advantages:** 1) Inexpensive, household, easy to make. 2) Kills insects, fungi, bacteria. 3) There is no harmful effect on crops. 4) A healthy and nutritious crop is produced. 5) Soil structure capacity and fertility is maintained.



## SCIENCE QUIZ

- Cobalt is a component of \_\_\_\_\_?  
a) Vitamin A      b) Vitamin D      c) Vitamin E      d) Vitamin B12
- Which of the following pairs represent two scalar quantities?  
a) Mass, Acceleration      b) Temperature, Torque      c) Distance, Speed      d) Gravitational Intensity, Work
- Which of these bones is not a part of human ear?  
a) Incus      b) Stapes      c) Femur      d) Malleus
- Nylon threads are made of \_\_\_\_\_.  
a) Polyester Polymer      b) Polyamide Polymer      c) Polyvinyl Polymer      d) Polysaccharide
- Which of the following is a non-metal that remains liquid at room temperature?  
a) Phosphorous      b) Bromine      c) Chlorine      d) Helium
- Quartz crystals normally used in quartz clocks etc. is chemically \_\_\_\_\_.  
a) Silicon dioxide      b) Germanium oxide      c) Germanium oxide and Silicon dioxide      d) Sodium silicate
- Food cans are coated with tin and not with zinc because-  
a) Zinc is more reactive than tin      b) Zinc is less reactive      c) Zinc is costlier than tin      d) Zinc has a higher melting point than tin