SCIENCE CENTRE NEWS LETTER

September 2022
Issue 78

SCIENCE CENTRE
Volume 7, Issue 6

WHAT'S NEW IN SCIENCE?

Researchers find brain mechanism that automatically links objects in our minds

When people see a toothbrush, a car, a tree - any individual object - their brain automatically associates it with other things. It naturally occurs with, allowing humans to build context for their surroundings and set expectations for the world.
By using machine-learning and brain imaging, researchers measured the extent of the "co-occurrence" phenomenon and identified the brain region involved. The findings appear in Journal 'Nature Communications' on 8 July, 2021.
"When we see a refrigerator, we think we're just looking at a refrigerator, but in our mind, we're also calling up all the other things in a kitchen that we associate with a refrigerator," said corresponding author Mick Bonner, a Johns Hopkins University cognitive scientist. "This is the first time anyone has quantified this and identified the brain region where it happens."

In a two-part study, Bonner and co-author, Russell Epstein, a psychology professor at the University of Pennsylvania, used a database with thousands of scenic photos with every object labelled. There were pictures of household scenes, city life, nature - and the pictures had labels for every mug, car, tree, etc. To quantify object co-occurrences, or how often certain objects appeared with others, they created a statistical model and algorithm that demonstrated the likelihood of seeing a pen if you saw a keyboard, or seeing a boat if you saw a dishwasher.

With these contextual associations quantified, the researchers next attempted to map the brain region that handles the links.

While subjects were having their brain activity monitored with functional magnetic resonance imaging, or MRI, Researchers showed them pictures of individual objects and looked for evidence of a region whose responses tracked this co-occurrence information. The spot they identified was a region in the visual cortex commonly associated with the processing of spatial scenes.
"When you look at a plane, this region signals sky and clouds and all the other things," Bonner said. "This region of the brain long thought to process the spatial environment is also coding information about what things go together in the world."
Researchers have long-known that people are slower to recognize objects out of context. Researchers believe this is the first large-scale experiment to quantify the associations between objects in the visual environment as well as the first insight into how this visual context is represented in the brain.
"We show in a fine-grained way that the brain actually seems to represent this rich statistical information," Bonner said.

SCIENTIST OF THE MONTH

Amal kumar Raychaudhuri

Amal kumar Raychaudhuri was born in Barisal (now in Bangladesh) on 14 September 1923. He had his early education in Tirthapati Institution and later completed matriculation from Hindu School, Kolkata. He earned B.Sc. from the Presidency College in 1942 and M.Sc. in 1944 from Science College of Calcutta University and he joined Indian Association for the Cultivation of Science (IACS) in 1945 as a research scholar. In 1952, he took a research with the Indian Association for the Cultivation of Science (IACS), but he required to work on the properties of metals rather than general relativity. Despite these adverse pressures, he was able to derive and publish the equation which is now named for him a few years later. Raychaudhuri equation is a key ingredient in the proofs of the PenroseHawking singularity theorems.

Some years later, having learned that his 1955 paper was highly regarded by notable physicists, such as Pascual Jordan, Raychaudhuri was sufficiently emboldened to submit a doctoral dissertation and received his Doctor of Science degree at the University of Calcutta (with one of the examiners, Prof John Archibald Wheeler recorded special appreciation of his work) in 1959.

During 1980-82, he was President of the Indian Association of General Relativity and Gravitation. He was elected Fellow of the Indian Academy of Sciences in 1982. He was awarded Professor A.C. Banerji Memorial Lecture Award in 1989 by National Academy of Sciences. He was died on 18 June, 2005 at the age of 81.

SCIENCE FACTS SEPTEMBER 2022

5th Sep 1962	India's first Vice President Dr. Sarvapalli Radhakrishnan was born on this day. (" Teacher's Day ")
6th Sep 1766	John Dalton (Inventor of Law of partial pressure & Thermal Expansion) was born on this day.
8th Sep	"International Literacy Day". (UNESCO)
10th Sep 1869	Reverend Jon Scobie invented First Autorickshaw in Japan
10th Sep 1892	Arthur Holly Compton (Inventor of Compton effect) was born on this day.
12th Sep 1992	Mae Jemison, first black woman went into the Space.
14th Sep 1959	Russian first Spacecraft "Luna-2" reached at the surface the moon
15th Sep 1830	World's first inter city passenger railway started between Liverpool and Manchester.
15th Sep 1916	First Tank ever used in Combat by British Army, during battle of the "Somme".
16th Sep	"International Day for the preservation of the Ozone Layer". (U.N.)
21st Sep	"International Day of Peace"(U.N.).
22nd Sep 1791	Michael Faraday (Discoverer of electromagnetic Induction) was born on this day.
23rd Sep	Winter equinox: On this day, Day and night becomes equal on the earth.
28th Sep	"World Rabies Day". (WHO)
29th Sep 1901	Enrico Alberto Fermi (Noble Prize winner in physics for his work on "Induced Radioactivity) was born on this day.
29th Sep	"World Heart Day". (WHO)

U. N. : United Nations

WHO : World Health Organization

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

Timings
Tuesday to Sunday
& Public Holidays
9.30 am to 4.30 pm

Address
Science Centre
City Light Road,
Surat - 395 007

Contact
0261 - 2255947
+91 97277 40807

Fax No.
91-261-2255946

E mail
sciencecentre@suratmunicipal.org

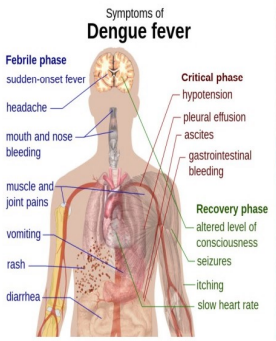
Web Site
www.suratmunicipal.gov.in

SCIENTIFIC QUESTION

Dengue

Dengue fever is a mosquito-borne disease caused by the dengue virus. Symptoms typically begin three to fourteen days after infection. These may include a high fever, headache, vomiting, muscle and joint pains, and a characteristic skin itching and skin rash. Recovery generally takes two to seven days. In a small proportion of cases, the disease develops into a more severe dengue hemorrhagic fever, resulting in bleeding, low levels of blood platelets and blood plasma leakage or into dengue shock syndrome, where dangerously low blood pressure occurs.

Dengue is spread by several species of female mosquitoes of the Aedes genus, principally Aedes aegypti. The virus has five serotypes (distinct variation within a species of bacteria or virus or among immune cells of different individuals). Infection with one type usually gives lifelong immunity to that type, but only short-term immunity to the others. Subsequent infection with a different type increases the risk of severe complications. A number of tests are available to confirm the diagnosis including detecting antibodies to the virus or it's RNA.



Signs and Symptoms:

Typically, people infected with dengue virus are asymptomatic (80%) (Patient is as carrier for a disease or infection but experience no symptoms) or have only mild symptoms such as an uncomplicated fever. Others have more severe illness (5%) and in a small proportion it is life-threatening. The incubation period (time between exposure and onset of symptoms) ranges from 3 to 14 days.

The characteristic symptoms of dengue are sudden-onset fever, headache (typically located behind the eyes), muscle and joint pains, and a rash. An alternative name for dengue, "breakbone fever", comes from the associated muscle and joint pains. The course of infection is divided into three phases: febrile, critical, and recovery.

The febrile phase involves high fever potentially over 40 °C (104 °F) usually lasts two to seven days. Nausea and vomiting may also occur. A rash occurs with symptoms in the first or second day of symptoms as flushed skin as a measles-like rash. In some people, the disease proceeds to a critical phase as fever resolves. During this period, there is leakage of plasma from the blood vessels, typically lasting one to two days. This may result in fluid accumulation in the chest and abdominal cavity as well as depletion of fluid from the circulation and decreased blood supply to vital organs. The recovery phase occurs next, with resorption of the leaked fluid into the bloodstream.

Cause:

Dengue fever virus is an RNA virus of the family Flaviviridae; genus Flavivirus. Most are transmitted by arthropods (mosquitos), and are therefore also referred to as arboviruses.

Dengue virus is primarily transmitted by Aedes mosquitos, particularly Aegypti. These mosquitos usually live between the latitudes of 35° North and 35° South below an elevation of 1,000 metres (3,300 ft). Humans are the primary host of the virus.

When a mosquito carrying dengue virus bites a person, the virus enters the skin together with the mosquito's saliva. It binds to and enters white blood cells, and reproduces inside the cells while they move throughout the body. The white blood cells respond by producing several signaling proteins, such as cytokines and interferons, which are responsible for many of the symptoms, such as the fever, the flu-like symptoms, and the severe pains.

Diagnosis:

The diagnosis of dengue is typically made clinically, on the basis of reported symptoms and physical examination. A probable diagnosis is based on the findings of fever plus two of the following: nausea and vomiting, rash, generalized pains, low white blood cell count.

Prevention:

Prevention depends on control and protection from the bites of the mosquito that transmits it. The primary method of controlling A. aegypti is by eliminating its habitats. This is done by getting rid of open sources of water. People can prevent mosquito bites by wearing clothing that fully covers the skin, using mosquito netting while resting and the application of insect repellent. International Anti-Dengue Day is observed every year on 15 June.

KNOW THE EXHIBIT

Early Rockets: Part-4

This Exhibit is situated at "Entering Space Gallery" between Fun Science Gallery and Power of Play Gallery at the first floor of Science Centr

In the year 1915, a young professor of Clark College, Robert H Goddard launched a rocket at his own expense. Though partially successful, this experimentation grabbed the attention of three leading American institution who believed that one day this guy will pave the way for mankind to escape the Earth. Smithsonian Institution in Washington D. C., Clark University and Worcester polytechnic institute came forward to support his research on Rocketry. Funded by them, in 1919, Goddard published his article explaining the idea to send Rockets in space. A huge section of the scientific community of that time along with the press, criticized his article. New York Times (NYT) even went to the extent of writing that "Professor Goddard, …. Does not know the relation of action to reaction." Then, it was the sunny morning of 16th March, 1926. Goddard launched his newly modified Liquid Propelled Rocket from a snowy field outside Worcester, Massachusetts where only his wife Esthar and a couple of colleagues from Clark University were witness. Nullifying all the criticism, the rocket reached a height of about 41 feet and travelled a distance of 154 feet in just 2.5 sec and marked the first step of modern rocket. Goddard never lived to see his dream of a rocket travelling into space. He died of throat cancer at his home in Baltimore on Aug 10,1945, 50 years after the Editorial published in NYT, 1969, after the launch of Apollo 11, NYT again published a correction and said that "You are right, rockets do work in space. The time regrets the Error."

QUIZ

1. Brass get discoloured in Air because of the presence of which of the following gases in Air?
a) Oxygen b) Hydrogen Sulphide c) Carbon Dioxide d) Nitrogen

2. Which of the following is not an isotope of Hydrogen?
a) Tritium b) Deuterium c) Protium d) Yttrium

3. What Soda Water contains?
a) Carbonic Acid b) Sulphuric Acid c) Carbon Dioxide d) Nitrous Acid

4. Which of the following is the ancestor of "Broccoli"?
a) Cabbage b) Cauliflower c) Wild Cabbage d) Kale

5. Which of the following problem is associated with a burning of coal?
a) Carbon Dioxide Emission b) Acid Rain
c) Ash with Toxic Metal Supurity d) All of These

6. How wind is caused?
a) Uneven Heating of Earth's Surface b) Rotation of Earth
c) Local Conditions d) All of These

7. From what Solar Cells are made of?
a) Germanium b) Silicon c) Silver d) Aluminium