SCIENCE CENTRE NEWS LETTER

SCIENCE CENTRE Volume 8, Issue 11

February 2024
Issue 95

WHAT'S NEW IN SCIENCE?

Study reveals how hunger influences decision making

A study on mice has shown how gut-produced hunger hormones can influence decision making and drive an animal's behaviour.

The researchers said that the study findings demonstrate how the hunger hormone can cross the blood-brain barrier and directly impact the brain to drive activity, controlling a circuit in the brain that is likely to be the same or similar in humans. The blood-brain barrier is known to strictly restrict many substances in the blood from reaching the brain. The study had published in the journal, Neuron (peer reviewed online journal).

Researchers put mice in an arena that had some food and observed at how the mice acted when they were hungry or full. The researchers at University College of London, U.K (United Kingdom) observed that while all the mice spent time to investigate feed, the hungry ones had started eating. Reserchers also used brain imaging to study activity in the mice's ventral hippocampus (it is related to stress emotion and affect), which is a decision making part of the brain understood to help form and use memories to guide.

The researchers found that activity of brain cells in the ventral hippocampus increased when the mice approached the food and that this neural activity inhibited them from eating. However, when the mice were hungry, less neural activity in this brain region was observed and therefore they were not inhibited from eating. Researchers also found that this corresponded to high levels of the hunger hormone ghrelin circulating in the blood.

Further, by activating these ventral hippocampus neurons, the researchers were able to experimentally make mice behave as if they were full and therefore stop eating. Researchers also said that the findings could contribute to research into the mechanisms of eating disorders, along with other links between diet and other health outcomes such as

Courtesy - Joyous English School

SCIENTIST OF THE MONTH

Dr. Usha Ranjan Ghatak

Dr. Usha Ranjan Ghatak was born on 26th February 1931 at Brahmanbaria, Bengal of British India (presently in Bangladesh). He did Bachelor's in Chemistry from Asutosh College, Kolkata, West Bengal in 1951. He secured Master's degree in 1953 and Ph.D degree in 1957 from Rajabazar Science College, Kolkata.

He went to U. S (United States) in 1960 for post-doctoral studies. He returned to India to Indian Association of Cultivation of Science (IACS) in 1963 and worked there till his official retirement from service as the Director in 1996.

Dr. Ghatak's contributions were primarily on stereochemically (Chemistry in three dimension) controlled organic synthesis and he was known for developing methodologies for the synthesis of polycarbocyclic diterpenoids (it is chemical compound containing 20 carbon atoms) and bridged-ring compounds (it is an organic compound that has two or more rings possessing a bridge). He demonstrated total synthesis of compounds related to gibberellins, a group of growth-regulating plant hormones.

The Council of Scientific and Industrial Research awarded Dr. Ghatak the shanti Swarup Bhatnagar prize in 1974. The Chemical Research Society of India awarded him the Lifetime Achievement award in 2003. He died on 18th June 2005 at the age of 76.

Courtesy - Joyous English School

SCIENCE FACTS FEBRUARY 2024

2 February 1802	French Chemist Jean Baptiste Boussingault (Who made significant contributions to agricultural science, petroleum science and metallurgy) was born.
3 February 1966	The unmanned Soviet Luna 9 spacecraft makes the first controlled rocket-assisted landing on the moon.
4 February 1896	German Physicist Friedrich Hund (Known for his work on atoms and molecules) was born.
5 February 1915	American Physicist Robert Hofstadter (Co-winner of the 1961 Nobel Prize in Physics for his pioneering studies of electron scattering in atomic nuclei and for his consequent discoveries concerning the structure of nucleons) was born.
7 February 1979	Pluto moves inside Neptune's orbit for the first time since either was discovered.
8 February 1834	Russian Chemist Dmitri Mendeleev (Best known for formulating the periodic law) was born.
9 February 1789	German inventor of the stenography Franz Xaver Gabdsberger was born.
9 February 1910	French Biochemist Jacques Monod (Co-winner of the 1965 Nobel Prize in Physiology or Medicine for their discoveries concerning genetic control of enzyme and virus synthesis) was born.
12 February 1809	Heinrich Lenz (Formulated Lenz's law in electrodynamics) was born.
13 February 1910	American Physicist and eugenicist William Shockley (Co-winner of the 1956 Nobel Prize in Physics for their researches on semiconductors and their discovery of the transistor effect) was born.
14 February 1869	Scottish Physicist Charles Wilson (Co-winner of the 1927 Nobel Prize in Physics for his invention of the cloud chamber) was born.
14 February 1917	American mathematician Herbert A. Hauptman (Co-winner of the 1985 Nobel Prize in Chemistry for their outstanding achievements in the development of direct methods for the determination of crystal structures) was born.
15 February 1861	French Physicist Charles Edouard Guillaume (Winner of the 1920 Nobel Prize in Physics in recognition of the service he has rendered to precision measurements in Physics by his discovery of anomalies in nickel steel alloy) was born.
15 February 1873	German Chemist Hans von Euler Chelpin (Co-winner of the 1929 Nobel Prize in Chemistry for their investigations on the fermentation of sugar and fermentative enzymes) was born.
17 February 1888	German Physicist Otto Stern (Winner of the 1943 Nobel Prize in Physics for his contribution to the development of the molecular ray method and his discovery of the magnetic moment of the proton) was born.
18 February 1745	Italian Physicist Alessandro Volta (Who was a pioneer of electricity and power and is credited as the inventor of the electric battery) was born.
19 February 1473	Polish mathematician and astronomer Nicolaus Copernicus (Who formulated a model of the universe that placed the Sun rather than Earth at its center) was born.
19 February 1859	Swedish Chemist Svante Arrhenius (Winner of the 1903 Nobel Prize in Chemistry in recognition of the extraordinary services he has rendered to the advancement of Chemistry by his electrolytic theory of dissociation) was born.
21 February 1953	Francis Crick and James D. Watson discover the structure of the DNA molecule.
26 February 1946	Ahmed H. Zewail (Known as the father of femtochemistry) was born.
28 February 1915	Brazilian-born scientist Peter Medawar (regarded as the father of transplantation) was born.

U. N. : United Nations

WHO -World Health Organization

UNESCO - United Nations Educational Scientific & Cultural Organization

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

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

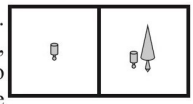
Web Site
www.suratmunicipal.gov.in

बहुजनहिताय बहुजनसुखाय

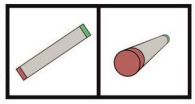
SCIENTIFIC QUESTION

Why does a person with only one eye have zero depth perception?

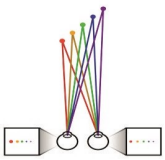
Having only one working eye does not lead to zero depth perception. Although using two eyes does indeed play a large role in depth perception, there are also many other approaches that the human visual system uses to perceive depth. In general, approaches that enable depth perception are called "depth perception cues" or simply "depth cues". Depth perception is the ability to see a scene as a three-dimensional world containing three-dimensional objects that move according to three-dimensional physics.

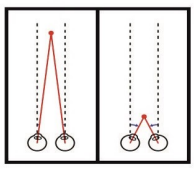


Two-Eye Parallax: One of the most important depth cues is two-eye parallax. Because each eye is at a different location below the forehead, each eye sees a slightly different view of the world. The difference between what person's left eye sees and what person's right eye sees depends on the three-dimensional shape of each object and its location in the three-dimensional world. The closer that an object is to a person, the greater the difference between what person's left eye sees and what person's right eye sees. The human brain is therefore able to extract depth information from the difference between what your two eyes see. If the image of a chair seen by your left eye and the image of the same chair seen by your right eye are nearly identical, then the chair must be far away. In contrast, if these two images of the chair are very different, then the object must be very close.



Vergence: The other two-eye depth cue is vergence. When person's two eyes both look directly at the same object, they both must rotate slightly toward each other to do this. How much person's eyes rotate depends on how close the object is. When an object is far away from person, person's two eyes only rotate toward each other a small amount in order to be both looking directly at the same object. In contrast, when an object is close to a person, person's two eyes most rotate toward each other a large amount in order to be both looking directly at the same object.





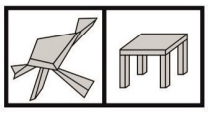
One-Eye Depth Cues: Although both two-eye depth cues—two-eye parallax and vergence—play significant roles in depth perception, they are not the only depth cues. The 19 other depth cues need only one eye to work. These cues are therefore called "one-eye depth cues" or "monocular depth cues". If a person only has one functioning eye, he can still see depth using these 19 other depth cues, which are as follows:

1. Motion Parallax: The eyes are moved in the direction of the object moves.

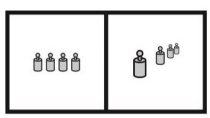
2. Kinetic Depth Effect: If the object is rotating, the brain can detect how far the part of the object is rotating and extract depth information.

3. Depth from Optical Expansion: When an object is moving steadily toward a person, its apparent size increases in a specific way. The rate at which it appears to get bigger depends on how far away it is and how fast it is moving toward a person. When the object is far away, it will appear to get bigger very slowly. When the object is very close, it will appear to get bigger quickly. This effect is called optical expansion. Person's brain can deduce not only the object's motion but also the object's distance.

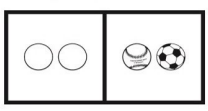
4. Familiar Shape: If an object has a familiar shape, person's brain can recall from memory the apparent shape of that object that corresponds to viewing the real object. In this way, the three-dimensional shape of the object can be perceived without needing any other depth cues.



5. Relative Size: If two objects in person's field of view are the same type of object, then person's brain assumes that their true physical sizes must be the same. Therefore, person's brain assumes that the difference in their perceived sizes must be solely caused by perspective effects. Person's brain can therefore extract depth information based on how much the perceived sizes of the two objects differ.



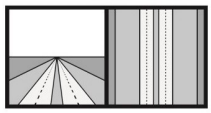
6. Familiar Size: If a certain object has a known size, then its perceived size corresponds to how far away it is, even if there are no other objects in the field of view to compare it to.



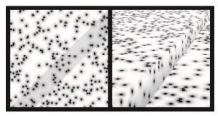
7. Estimated Size: Amazingly, even if a person see an object that has nothing to compare it to and has an unfamiliar shape and size, person's brain can still extract depth information from its perceived size by estimating its true size.

8. Uniform Size: For a single object, extended object that is known to be roughly constant in size along its length, the parts of the object that appear to be smaller must be farther away because of perspective effects.

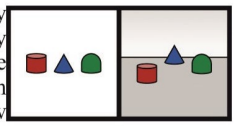
9. Parallel Lines: This cue can be thought of as a general case of the uniform size depth cue. This is because when two lines are parallel to each other in the real World, this is equivalent to a single overall object having a uniform size along its length.



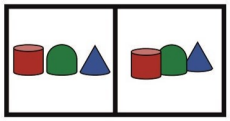
10.Texture Gradient: Similar to how objects that are closer to person appear larger, parts of the pattern in a texture that are closer to you will appear larger.



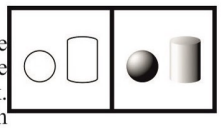
11. Horizon Effect: For an object sitting on the ground, the physics dictates that the closer the object's center appears to be to the horizon, the farther away the object is from a person. Your brain can therefore estimate how far away an object is from how close its center appears to be to the horizon line.



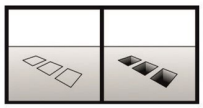
12. Occlusion: When a near object is roughly in the same line of sight as a distant object, the near object will partially or completely block the view of the distant object. Therefore, the object that is being blocked from view must be farther away from a person.



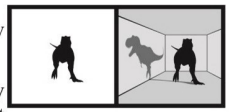
13. Surface Shading: The way that light falls on an object depends on the three-dimensional shape of the object. The parts of an object that are darker tend to be the parts that are titled away from the light source.



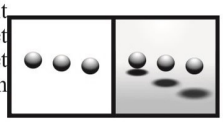
14. Recess Shading: The points on an object or landscape that are recessed will appear darker because light has a harder time reaching down into the recess. The recess shading therefore conveys the depth and shape of the recesses.



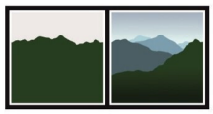
15. Shadow Shape: The shape of a shadow depends on the three-dimensional shape of the object that is casting the shadow. Therefore, your brain can partially deduce three-dimensional shape information from an object's shadow.



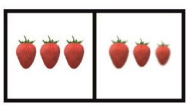
16. Shadow Size, Location, and Blurriness: The size, location, and blurriness of an object's shadow all depend on how far away the object is from the shadowed surface. In general, the farther away an object is from the shadowed surface, the larger, the blurrier, and the more shifted its shadow will be.



17. Atmospheric Effects: When an object is very far away, the air between a person and the object changes its appearance.



18. Accommodation and Pupil Response: In order for the human eye to properly focus on objects that are at different distances from it, the ciliary muscles in the eye must change the shape of the eye lens by changing the amount of muscle contraction. To bring a distant object into focus, the ciliary muscles relax, which allows the lens to flatten. To bring a near object into focus, the ciliary muscles contract, which pushes the lens into a rounder shape.



19. Depth from Defocusing: When the human eye brings a certain object into focus, objects that are at a different distance will appear blurrier. The amount of observed blur depends on how far away in the forward direction the other objects are from the object that is in focus.

Courtesy - Joyous English School

KNOW THE EXHIBIT

Health in Space – Immunity Problems

The immune systems of Astronauts on lengthy missions seems to change while in space, turning a simple cold or the flu into a potentially serious health risk. In Space, viruses that are helpful to humans, under changed condition becomes confused and attacks body parts. When the cell function goes into overdrive, the immune system overreacts, causing allergies and rashes. On Earth, our immune systems change if we don't get enough sleep or nutrition or if we are under too much stress.

The distribution of immune cells doesn't change much, but the functioning of the cells may be higher or lower than normal, confusing the immune system. When the immune cell function slacks off, dormant viruses in a human body can reactive, through without symptoms of sickness. When the cell function goes into overdrive, the immune system over reacts causing allergies and rashes.

"Things like radiation, microbes, stress, microgravity, altered sleep cycles and isolation could all have an effect on crew member immune systems. If the situation persisted for longer deep space missions, it could possibly increase risk of infection, hyper sensitivity or autoimmune issues for exploration Astronauts." said NASA (National Aeronautics and Space Administration) Immunologist Brian Crucian.

If necessary, NASA will use newer kinds of radiation shielding, nutrition supplements and medications to counteract these changes to the immune system.

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. Tapti Valley International School had participated their project on 'Green Hydrogen: Future Fuel' under the sub theme of 'Affordable and Clean Energy'.

The aim of the project is to collect green Hydrogen from water through electrolysis (it is a process of decomposing ionic compound into their elements by passing a direct electric current through the compound in a fluid form). The project demonstrates the process of electrolysis and collection of Hydrogen gas. Hydrogen gas is used as fuel to generate electricity.

QUIZ

1.What is the physical phase of life called?

a) Protoplasm b) Cytoplasm c) Organelles d) None of the above

2. The largest cell is _____.

a) Nerve Cell b) Ovum c) The egg of an Ostrich d) None of the above

3. There are _____ number of muscles in human.

a) 638 b) 637 c) 639 d) 640

4) The number of ribs in a human body is _____.

a) 23 b) 24 c) 25 d) 22

5) Which is the vertebrate that has two chambered heart?

a) Fish b) Snake c) Blue Whale d) Crocodile

6) What is the life span of RBC?

a) 130 days b) 110 days c) 100 days d) 120 days

7) What is the life span of WBC?

a) 2-15 days b) 3-15 days c) 4-15 days d) 5-20 days