

SCIENCE CENTRE NEWS LETTER

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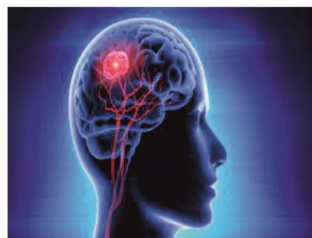
SCIENCE CENTRE

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WHAT'S NEW IN SCIENCE?

A New way to visualize Brain Cancer

Researchers from Brigham and Women's Hospital, Boston, a founding member of Mass General Brigham, Boston and the Massachusetts Institute of Technology (MIT), Cambridge, have unveiled unprecedentedly detailed images of brain cancer tissue through the use of a new microscopy technology called decrowding expansion pathology (dExPath) (it can expand proteins away from each other in human brain pathology specimens). Their findings published in Science Translational Medicine, provide novel insights into brain cancer development with potential implications for advancing the diagnosis and treatment of aggressive neurological diseases.



"This technology brings reliable, super-resolution imaging to the clinic, enabling scientists to study neurological diseases at a never-before-achieved nanoscale level on conventional clinical samples with conventional microscopes." said Pablo Valdes, MD (Doctor of Medicine), Assistant Professor at Brigham and Women's Hospital.

This new technology chemically modifies tissues by embedding them in a gel and 'softening' the tissues with a special chemical treatment that separates protein structures without destroying them and which allows tissues to expand.

However, Antibodies are large and many times cannot easily penetrate cell structures to reach their target. By pulling proteins apart with dExPath, these same antibodies used for staining can penetrate spaces to bind proteins in tissue that could not be accessed before expansion, highlighting nanometer scale.

To validate the effectiveness of dExPath, Researchers applied the technology to healthy human brain tissue, high and low-grade brain cancer tissues, and brain tissues affected by neurodegenerative diseases including Alzheimer's and Parkinson's diseases. Investigators stained tissue for brain and disease specific biomarkers and captured images before and after expanding samples with dExPath. The results revealed uniform and consistent expansion of the tissue without distortion, enabling accurate analysis of protein structures.

dExPath imaging revealed that tumors previously classified as "low-grade" contained more aggressive features and cell populations, suggesting the tumor could become far more dangerous than anticipated. This technology is still in its early stages and Researchers aspires for this technology to eventually serve as a diagnostic tool, ultimately enhancing patient outcomes.

Courtesy - Mount Litera Zee School

SCIENTIST OF THE MONTH

Dr. Amitava Raychaudhuri

Dr. Amitava Raychaudhuri was born on 17th March, 1952 at Kolkata, West Bengal. He was graduated in Physics from South Point School, Kolkata in 1970 and obtained post-graduate degree at Delhi University in 1973. Under the guidance of Dr. Oscar W. Greenberg, Amitava Raychaudhuri obtained Ph.D degree in Particle Physics from the University of Maryland, College Park, Washington, USA in 1977.



After post-doctoral work at the University of Oxford, England and the Tata Institute of Fundamental Research, Mumbai, he joined the Rajabazar Science College of University of Kolkata in 1980 as a Lecturer in Physics, where he became Reader and Professor.

Dr. Raychaudhuri has worked in diverse

areas within Particle Physics encompassing Quantum Chromodynamics [it is the theory of the strong interaction between quarks (it is a type of elementary particle and fundamental constituent of matter) and gluons (it is a type of elementary particles)], Grand Unified Theories (GUT) (it is model in particle Physics that merges the electromagnetic, weak and strong forces into a single force at high energies) and super symmetry [it is a theoretical framework in Physics that suggests the existence of a symmetry between particles with integer spin (boson) and particles with half-integer spin (fermions)].

Dr. Raychaudhuri was the recipient of the INSA (Indian National Science Academy) Young Scientist Award in 1982, the Shanti Swarup Bhatnagar Prize for Science and Technology in 1997.

Courtesy - Mount Litera Zee School



Timings

Tuesday to Sunday
& Public Holidays

9.30 am to 4.30 pm

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SCIENCE FACTS MARCH 2024

1 March 1910	English Chemist John Porter Martin (Co-winner of the 1952 Nobel Prize in Chemistry for the invention of partition chromatography) was born.
4 March 1774	First sighting of Orion Nebula by William Herschel.
6 March 1869	Dmitri Mendeleev presents the first periodic table to the Russian Chemical Society.
7 March 1938	American Biologist David Baltimore (Co-winner of the 1975 Nobel Prize in Physiology or Medicine for their discoveries concerning the interaction between tumour viruses and the genetic material of the cell) was born.
8 March 1618	Johannes Kepler discovers the third law of planetary motion.
8 March 1879	German Chemist Otto Hahn (Winner of the 1944 Nobel Prize in Chemistry for his discovery of the fission of heavy nuclei) was born.
8 March 1886	American Chemist Edward Calvin Kendall (Co-winner of the 1950 Nobel Prize in Physiology or Medicine for their discoveries relating to the hormones of the adrenal cortex, their structure and biological effect) was born.
9 March 1923	Austrian born Physicist Walter Kohn (Co-winner of the 1998 Nobel prize in Chemistry for his development of the density-functional theory) was born.
10 March 1923	American Nuclear Physicist Val Logsdon Fitch (Co winner of the 1980 Nobel Prize in Physics for the Discovery of violations of fundamental symmetry principles in the decay of neutral K-mesons) was born.
12 March 1925	Japanese Physicist Leo Esaki (Co- winner of the 1973 Nobel Prize in Physics for their experimental discoveries regarding tunneling phenomena in semi conductors) was born.
13 March 1899	American Physicist John Hasbrouck (Co-winner of the 1977 Nobel Prize in Physics for his contributions to the understanding of the behavior of electronic magnetism in solids) was born.
14 March 1854	German Scientist Paul Ehrlich (Co-winner of the 1908 Nobel Prize in Physiology or Medicine in recognition of their work on immunity) was born.
14 March 1879	German-born Physicist Albert Einstein (Winner of the 1921 Nobel Prize in Physics for his service to Theoretical Physics and especially for his discovery of the law of the photoelectric effect) was born.
15 March 1930	Russian Physicist Zhores Ivanovick Alferov (Co-winner of the 2000 Nobel Prize in Physics for the development of the semiconductor heterojunction for optoelectronics) was born.
16 March 1789	German Physicist Georg Simon Ohm (Known for Ohm's law) was born.
16 March 1918	American Physicist Frederick Reines (Co-winner of the 1995 Nobel Prize in Physics for his co-detection of the neutrino) was born.
19 March 1900	French Physicist Frederic Joliot (Co-winner of the 1935 Nobel Prize in Chemistry for their discovery of induced radioactivity) was born.
19 March 1943	Mexican Chemist Mario J. Molina (Co-winner of the 1995 Nobel Prize in Chemistry for their discovery of the role of CFCs in ozone depletion) was born.
21 March 1932	American Chemist Walter Gilbert (Co-winner of the 1980 Nobel Prize in Chemistry for their contributions concerning the determination of base sequences in nucleic acids) was born.
22 March 1868	American Physicist Robert Millikan (Winner of the 1923 Nobel Prize in Physics for his work on the elementary charge of electricity and on the photoelectric effect) was born.
23 March 1881	German Chemist Hermann Staudinger (Winner of the 1953 Nobel Prize in Chemistry for his discoveries in the field of macromolecular chemistry) was born.
28 March 1930	American Physicist Jerome Isaac Friedman (Co-winner of the 1990 Nobel Prize in Physics for their pioneering investigations concerning deep inelastic scattering of electrons on protons, which have been of essential importance for the development of the quark model in particle physics) was born.
U. N. : United Nations WHO -World Health Organization UNESCO - United Nations Educational Scientific & Cultural Organization	

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

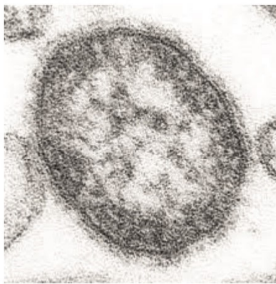
SCIENTIFIC QUESTION

What is Measles?

Measles is a highly contagious, vaccine-preventable infectious disease caused by measles virus. Its symptoms usually develop 10–12 days after exposure to an infected person and last 7–10 days. Initial symptoms typically include fever, often greater than 40 °C (104 °F), cough, running nose, and inflamed eyes. Small white spots known as Koplik’s spots may form inside the mouth two or three days after the start of symptoms. A red, flat rash which usually starts on the face and then spreads to the rest of the body typically begins three to five days after the start of symptoms. Common complications include diarrhea, ear infection and pneumonia.

Measles is an airborne disease which spreads easily from one person to the next through the coughs and sneezes of infected person. It may also be spread through direct contact with mouth or nasal secretions. It is extremely contagious: nine (9) out of ten (10) people who has less immunity and share living space with an infected person will be infected.

Sign and Symptoms: Symptoms typically begin 10–14 days after exposure. The classic symptoms include a four-day fever and the three Cs - cough, coryza (head cold, fever, sneezing) and conjunctivitis (red eyes)—along with a maculopapular rash (is a type of rash characterized by a flat, red area on the skin that is covered with small confluent bumps). Fever is common and typically lasts for about one week, the fever seen with measles is often as high as 40 °C (104 °F). Koplik’s spots seen inside the mouth are diagnostic for measles, but are temporary and therefore rarely seen. Koplik spots are small white spots that are commonly seen on the inside of the cheeks opposite the molars. They appear as "grains of salt on a reddish background." Recognizing these spots before a person reaches their maximum infectiousness can help reduce the spread of the disease. The characteristic measles rash is classically described as a generalized red maculopapular rash that begins several days after the fever starts. It starts on the back of the ears and after a few hours, spreads to the head and neck before spreading to cover most of the body. The measles rash appears two to four days after the initial symptoms and lasts up to eight (8) days. The rash is said to "stain", changing colour from red to dark brown, before disappearing.



Complications: Complications of measles are relatively common, ranging from mild ones such as diarrhea to serious ones such as pneumonia, laryngotracheobronchitis (it is viral infection), otitis media (it is inflammatory diseases of ear), acute brain inflammation.

Causes: Measles is caused by the measles virus. The virus is highly contagious and is spread by coughing and sneezing via close personal contact. It remains infective for up to two hours in that airspace or nearby surfaces. Measles is so contagious that if one person has it, 90% of non-immune people who have close contact with them will also become infected.

Diagnosis: Typically, clinical diagnosis begins with the onset of fever and malaise about 10 days after exposure to the measles virus, followed by the emergence of cough, coryza and conjunctivitis that worsen in severity over 4 days of appearing.

Laboratory diagnosis of measles can be done with confirmation of positive measles IgM antibodies (it is the largest of several isotypes of antibodies that produced by vertebrates) or detection of measles virus RNA (Ribonucleic Acid) from throat, nasal or urine specimen by using the reverse transcription [it is laboratory technique combining reverse transcription (it creates double-stranded DNA (Deoxyribonucleic Acid) from RNA templates) of RNA into DNA] polymerase chain reaction assay.

Prevention: Mothers who are immune to measles pass antibodies to their children while they are still in the womb. First dose of vaccine for Children is given at 12 months, generally as part of three- part MMR vaccine (is a vaccine against measles, mumps and rubella). A second dose of the vaccine is given to Children between the ages of four and five to increase rates of immunity.

Treatment: There is no specific antiviral treatment if measles develops. Instead the medications are generally aimed at treating superinfections, maintaining good hydration with adequate fluids and pain relief. Treatment is supportive with ibuprofen or paracetamol (acetaminophen) to reduce fever and pain.

Courtesy - Mount Litera Zee School

KNOW THE EXHIBIT

Your Weight Varies

Person's weight on Astronomical bodies in our solar system

The weight of a person is measured by the pull of Gravity between a person and the Astronomical body:

- 1) Person's mass (m) and the mass of the Astronomical body (M) on which person is standing.
- 2) The distance between the centre of the Astronomical body to a person.

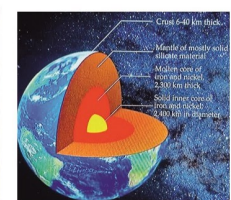
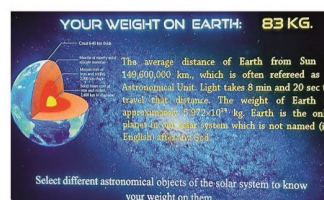
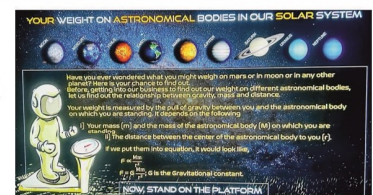
$$F \propto \frac{Mm}{r^2}$$

$$F = G \frac{Mm}{r^2}$$

G is the Gravitational constant.

Your Weight on Earth: The average distance of Earth from Sun is 149,600,000 km, which is often referred as 1 Astronomical Unit. Light takes 8 minute and 20 second to travel that distance. The weight of Earth is approximately 5.92×10^{24} kg. Earth is the only planet in our Solar system which is not named after any God.

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. Mount Litera Zee School had participated their project on 'Green house effect' under the sub theme of 'Climate Change and its Impact'.

The aim of the project is to nurture our nature so we can have a better future. Green house effect is a natural process and enable life on Earth by trapping heat from Sun in atmosphere.

It enhance Green house effect by green house gases like Carbon dioxide (CO₂), Methane (CH₄) and nitrous oxide (N₂O). These gases accumulate in atmosphere, creating a "Blanket" that trap more heat. The rise of temperature lead to Carbon dioxide known as Global Warming. So we must use renewable resource like solar energy, wind energy and tidal energy.



MOON GAZING

Science Centre Surat had organized an event to view 'Moon' through telescope at Science Centre on 16th February 2024 from 7:00 pm to 8:15 pm. Total 75 visitors have participated in this event.



MUSEUM ON WHEELS

The Chhatrapati Shivaji Maharaj Vastu Sangrahalaya in Mumbai, in collaboration with the Science Centre in Surat, organized a mobile exhibition that visited Surat city on the 28th and 29th of February, 2024. Named the 'Museum on Wheels', this exhibition is mounted within a bus, with the aim of reaching remote areas of India where local residents may face challenges in accessing traditional museums. The theme of the current exhibition is 'Ancient Sculptures', showcasing sculptures from civilizations across the world, particularly from India, Egypt, Assyria, Greece, and Rome. The display of unique sculptures is complemented by digital interactive devices and hands-on activities.

The exhibition was held as below:

Dt. 28/02/2024 at Science Centre Surat which was visited by 1033 visitors.

Dt. 29/02/2024 at Historical Fort of Surat which was visited by 290 visitors.



This initiative underscores the commitment to making cultural and historical artifacts accessible to diverse audiences, regardless of geographic constraints, while fostering interactive learning experiences through innovative means.

SCIENCE LECTURE

To celebrate 'National Science Day', Science centre had organized Science Lecture on "Artificial Intelligence (AI) and Cyber Security" on 28th February 2024. Dr. Ishwarbhai B. Patel, Professor, Department of Physics, Veer Narmad South Gujarat University, Surat and Mr. Shivang I. Patel, Cyber Security expert delivered lecture to students of std. 8 and 9. 205 students and 18 teachers from schools of Surat have participated this lecture. Dr. I. B. Patel gave information about how the Artificial Intelligence is useful in our life,

pros and cones of the AI. Mr. Shivang Patel explained about Cyber security and how scammers hack through mobile phones and social media. After the lecture there was question answer session in which students and teachers actively took part.

