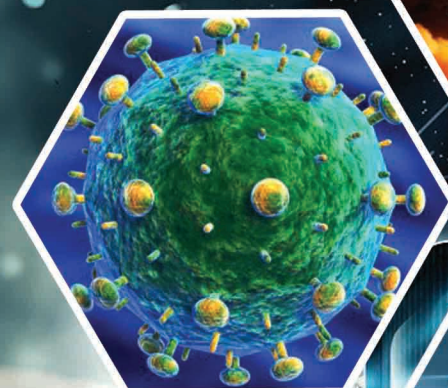
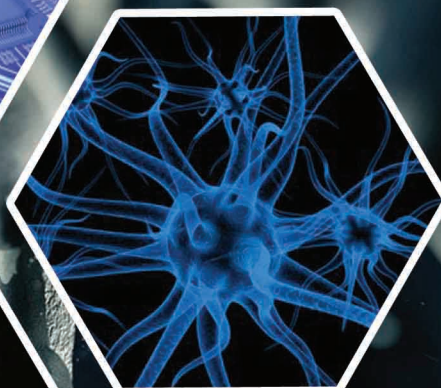
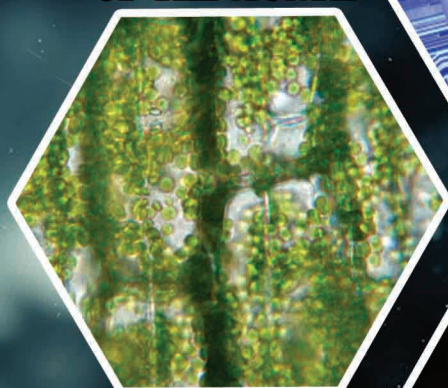


ISSUE NO 1

SCIENCE XPRESS

BRISTOL CORNER

**MOLECULE
OF THE MONTH**



**SCIENTIST PROFILES,
THIS MONTH IN SCIENCE,
NEWS, FUN, QUIZZES
AND MANY MORE...**



**VAGUSTOFF - STUFF
OF
THE VAGUS NERVE**



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Launch of **IRNSS 1A; A New Era in the field of Navigation**

Vol. No 1

August 2013

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FROM THE CHIEF EDITOR'S DESK...

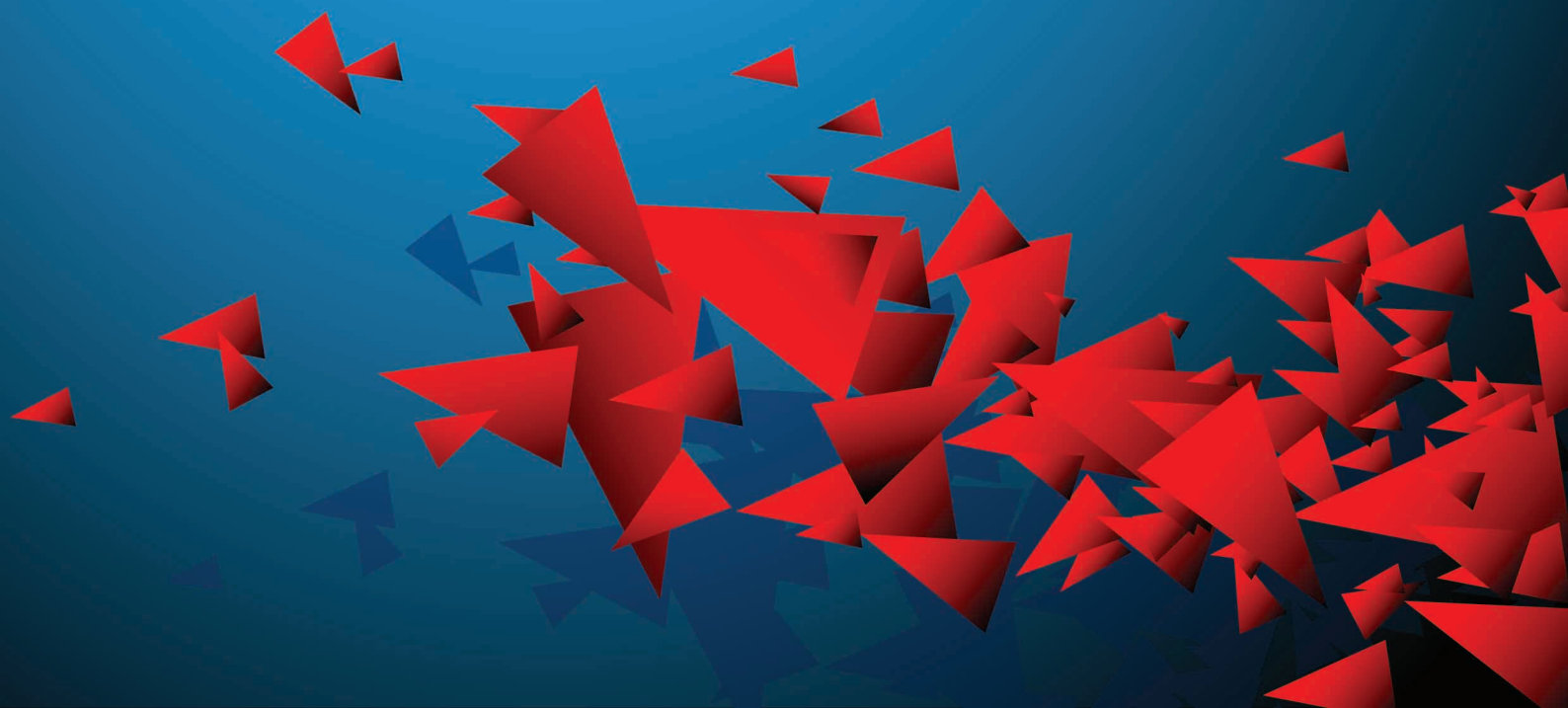
It gives me immense pleasure to introduce the "TSP SCIENCE XPRESS" to each of our esteemed readers. Big Bang, the most accepted theory of the creation of our universe brought Space-Time continuum into existence, and since then, time has been passing by. In these billions of years, starting from the atoms that brought us into existence, until the human beings, that we are now, never got a chance to look back. Time changed, it flew like something that never has an Undo button. Indeed, Time Travel is a one-way route where we are travelling in a single direction, to the future.

We are in the age when we are dreaming of replacing our organs with artificial ones and succeeding; we are in the Age of Science! I think it would not be proper on my part to say it is the Atomic Age or Age of Computers; since everything belongs to the entity we know as Science. Whether it is a tiny sub-atomic particle, or a huge spaceship flying into space, everything is just a sub-set in the Universal set of Science. To sum it up, we are in an era where Science has engulfed every aspect of our life, in fact Science itself is our life, and our life is Science! How interesting!

We, human beings, know less than a mere fraction of what Science has with it – and for us. In the contemporary era, the factor known as "Scientific Empowerment" is really essential for every living being on the planet Earth, and might be for the whole Universe, if extraterrestrials exist. We need it more than anything else since we have to struggle to thrive; we call it as "Struggle for Existence". Whether it is for food or water, or for a territory, we have to struggle, and we need Science with us to strengthen ourselves. Thus, we people at "The Scientific People" have tried to initiate the insatiable quest for knowledge within ourselves and our esteemed readers, trying to ignite the fire of the "Learning and Spreading Knowledge". We have tried our best to make this e-magazine worth reading for readers of all age groups and I hope our readers find the same too.

Happy reading and all the best!


(SUJIT KUMAR KAR)



CONTENTS

COVER STORY

LAUNCH OF IRNSS 1A : A NEW ERA IN THE FIELD OF NAVIGATION 5

BRISTOL CORNER

MOLECULE OF THE MONTH- WILKINSON'S CATALYST 10

ENVIRONMENT QUIZ 11

TSP SCIENTIST BIOGRAPHIES

EDWIN POWELL HUBBLE (1889-1953) 12

PHOTO GALLERY 14

FEATURED ARTICLE - CHEMISTRY

VAGUSSTOFF - NEUROTRANSMITTER FROM THE VAGUS NERVE 16

TSP 26 WORDS 19

THIS MONTH IN SCIENCE 21

IN THE NEWS... 23

WORD GAME 24

ASTRONOMY QUIZ 25

TSP FACTS OF THE MONTH

VENUS FLYTRAP PLANT 27

THE LOCAL GROUP 28

DEATH OF A STAR 29

TRIBOLUMINESCENCE 30

Launch of IRNSS 1A



A New Era in the field of NAVIGATION

1st of July, 2013, 11:41 PM. It was a glorious moment for the officials, scientists and dignitaries at the Mission Control Centre of Satish Dhawan Space Centre of Sriharikota, India. All this rush was for the launch of the first satellite dedicated towards the working of India's own navigation system, i.e. IRNSS – 1A. The countdown clock ticked, and the PSLV-C22 rocket carried away this satellite into space to place it in a prescheduled Geosynchronous orbit approximately 36,000 kilometres above the Earth's surface. After a flight of 20 minutes and 17 seconds, the satellite was injected into the elliptical orbit of 282.46 km x 20,625.37 km.

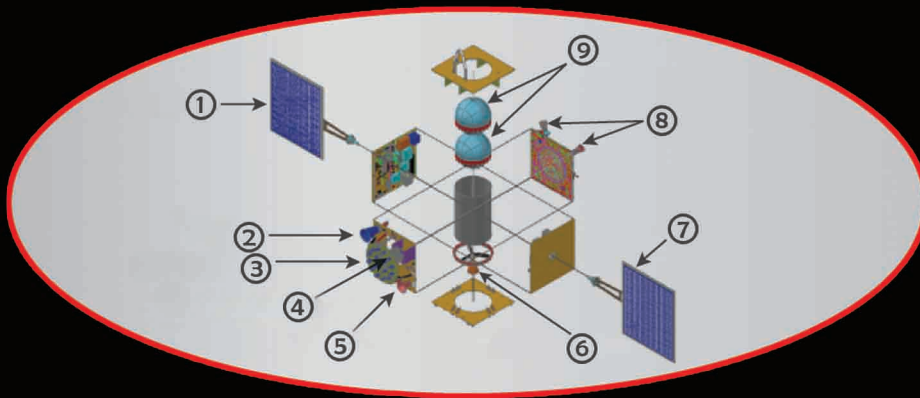


About IRNSS-1A:

IRNSS-1A is the first satellite in India's autonomous regional satellite navigation system. Indian Regional Navigational Satellite System or IRNSS, aims to launch 7 satellites among which IRNSS-1A was the first one to go into orbit. Along with a lift-off mass of 1425 kg, this satellite was launched into a sub Geosynchronous Transfer Orbit (sGTO) with a 282.46 km perigee and 20,625.37 km apogee with an inclination of 17.86 degrees with respect to Earth's equatorial plane.



The Satellite – Payloads and Composition :



1. Solar Panel

4. Corner Cube
Retro Reflector

7. Solar Panel

2. Global Horn

5. C-Band Horn

8. Star Sensors

3. Dual Helix
Antenna

6. Liquid Apogee
Motor

9. Propellant
Tanks

The satellite consists of two types of payloads- Navigation payload and Ranging payload. A highly accurate Rubidium Atomic Clock is a part of the Navigation payload of the satellite. The Ranging payload consists of a C-band transponder. It also carries Corner cube retro reflectors.

The satellite had a lift-off mass of 1425 kg. It has two solar panels with Ultra Triple Junction solar cells, along with one Lithium ion battery of 90 Ampere-hour capacity. It is equipped with Sun & Star sensors, as well as Gyroscopes. It has been equipped with an Attitude and Orbit Control System (AOCS), which maintains the satellite's orientation with the help of reaction wheels, magnetic torquers and thrusters. The propulsion system of this satellite consists of a Liquid Apogee Motor(LAM) and thrusters.

IRNSS Physical Features

Lift-off Mass	1425 Kilograms
Dry Mass	614 Kilograms
Dimensions	1.58 m x 1.5 m x 1.5 m
Power	<ul style="list-style-type: none">• 2 x Solar Panels (1660 W production)• 1 x Lithium ion battery (90 Ampere-hour capacity)
Propulsion System	<ul style="list-style-type: none">• Liquid Apogee Motor (440 N)• 12 x 22 Newton Thrusters
Control System	<ul style="list-style-type: none">• Sun & Star Sensors• Gyroscopes• Reaction Wheels• Magnetic Torquers• 22 Newton Thrusters

Satellite in Orbit :

IRNSS-1A is launched into a sub Geosynchronous Transfer Orbit (sGTO) with a 282.46 km perigee and 20,625.37 km apogee with an inclination of 17.86 degrees with respect to the Earth's equatorial plane. After injection into the preliminary orbit, initial orbit raising manoeuvres placed it in a circular Geosynchronous Orbit (GSO) at 55 degrees East location with an inclination of 29 degrees with respect to the Equator.

Working Principle & Organized Functionalities :

The two Solar panels provided with the satellite are equipped with Ultra Triple Junction Solar cells that generate about 1660 Watts of electrical power. Sun & Star sensors along with Gyroscopes provide orientation reference for the satellite. There are certain special thermal control schemes implemented for critical elements such as atomic clocks. The Attitude and Orbit Control System (AOCS) maintains the satellite's orientation. The Liquid Apogee Motor (LAM) and thrusters are major components in the propulsion system of the satellite. The Navigation payload will transmit navigation service signal to the users. It will operate in L5 band at 1176.45 MHz and S band at 2492.028 MHz. The Rubidium clock will maintain accuracy in timing. The Ranging payload consists of a C -band transponder to facilitate accurate determination of the range of the satellite. The Corner Cube Retro Reflectors are used for LASER ranging.

The Launch :

Polar Satellite Launch Vehicle (PSLV) launched IRNSS-1A into its orbit, in its twenty-fourth flight. This vehicle, PSLV- C22, used the powerful 'XL' version of the PSLV. This was the fourth time such a configuration was being flown. The launch took place from the First Launch Pad (FLP) of Satish Dhawan Space Centre (SDSC), SHAR, Sriharikota.

Previous flights of PSLV-XL

Configuration :

- PSLV-C 11 : Chandrayaan 1
- PSLV-C 17 : GSAT-12
- PSLV-C 19 : RISAT-1

Cost

IRNSS-1A was developed at a cost of **125 Crores**

Indian Rupees, which is equal to

US \$ 22 million, and the whole IRNSS system of 7 satellites will be completed with a total budget of

Rs. 1,420 Crore

or around

US \$ 250 Million.

PSLV C22 Salient Features

Lift-off Mass	320 tons
Stages	4
Height	44 metres
Strap-on motors	6
Fuels Used	<ul style="list-style-type: none">•Hydroxyl Terminated Poly Butadiene (HTPB)•Unsymmetrical Dimethyl Hydrazine + 25 % Hydrazine Hydrate (UH25)•Nitrogen Tetroxide (N2O4)•Mono Methyl Hydrazine (MMH)•MON-3 : Mixed Oxides of Nitrogen

IRNSS – The System :

Indian Regional Navigational Satellite System is an autonomous satellite system being developed by India. It will contain seven satellites, with three satellites in Geostationary Orbit (GEO) and four satellites in Geosynchronous Orbits (GSO). It will contain two segments, the Space segment and the Ground segment. Its primary service area includes Indian Mainland, as well as the region extending up to 1500 kilometres from its boundary, i.e. the area enclosed by 30 degrees South to 50 degrees North latitudes ; and from 30 degrees East to 130 degrees East longitudes. IRNSS will provide two types of services, i.e. Standard Positioning Service (SPS), which is a common user interface, and an encrypted Restricted Service (RS) provided to authorized users. The system is expected to provide a position accuracy of better than 20 metres in the primary service area, i.e. Indian Mainland. The launch of this satellite placed India in the elite club of the countries having independent navigation systems. It brought India up as the third country in the navigational front, USA being the first with GPS and Russia with GLONASS. IRNSS will find its application in fields such as :

- Terrestrial, Aerial & Marine Navigation
- Disaster Management
- Vehicle tracking & Fleet Management
- Integration with mobile phones
- Precise timing
- Mapping & Geodetic data capture
- Terrestrial navigation aid for travelers
- Visual & Voice navigation aid for drivers

Every particle in our unending Universe has a brighter as well as a dark side, and it's the brighter side that still keeps the Universe and mankind intact. Hopefully, IRNSS mission will solve its purposes and serve mankind in the best possible ways.



We have several fun filled features such as Quizzes and Jumbled words in this issue, however, all the answers of the questions and quizzes will be published in the succeeding month, please look for the next issue to find out the answers to the same.

Bristol Corner – Molecule Of The Month

July, 2013 – Wilkinson's Catalyst

Writer : Simon Cotton, University of Birmingham

Wilkinson's Catalyst or Chlorotris(Triphenylphosphine)rhodium(I) is a very famous inorganic catalyst. It was discovered accidentally by Fred Jardine, a PhD student working for Geoffrey Wilkinson. He was trying to make the compound Hydrated Rhodium Trichloride react with excess of Triphenylphosphine in boiling Ethanol.

This compound looks like Burgundy colored crystals, and sometimes it appears as orange crystals of another polymorph having the same molecular structure.

It is used as a very active catalyst for rapid homogenous hydrogenation.

However, this compound is known not to reduce Benzene rings, Carbonyl or Carboxyl groups, even Nitrile or Nitro groups are not reduced by this catalyst.

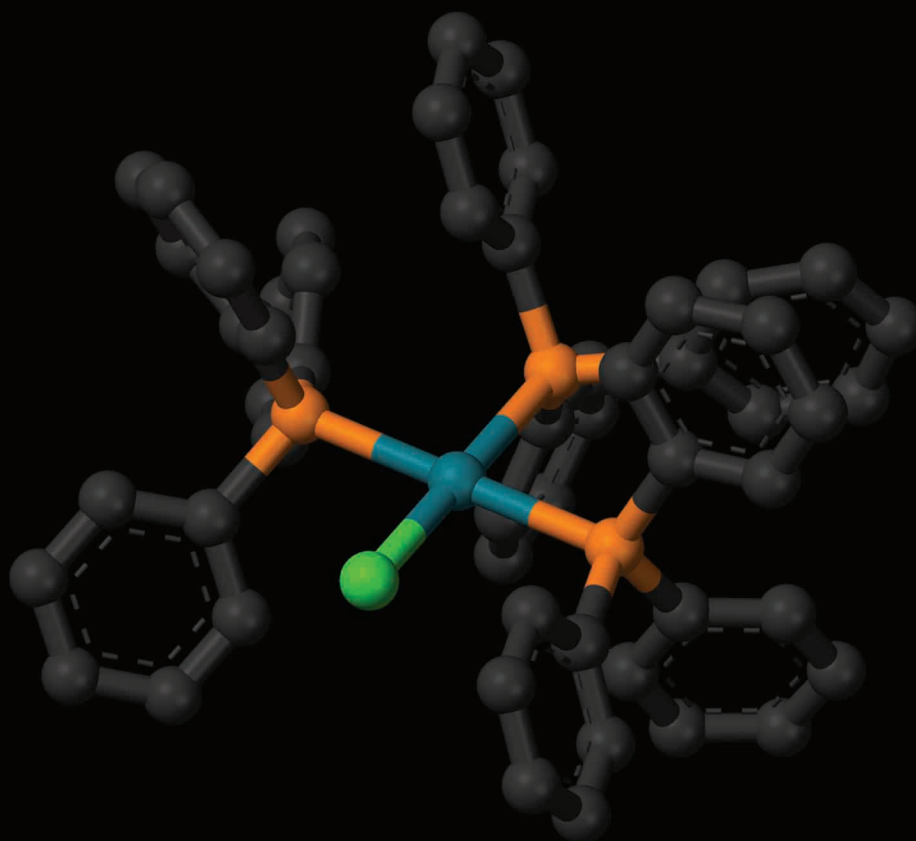
It has been named as Wilkinson's Catalyst since Geoffrey Wilkinson led the research group that pioneered the development of this molecule and its applications.

Read more about Wilkinson's Catalyst at :

<http://www.chm.bris.ac.uk/motm/wilcat/wilcath.htm>

Bristol University- Molecule of The Month page :

<http://www.chm.bris.ac.uk/motm/motm.htm>



ENVIRONMENT QUIZ

1. What is the blanket of air surrounding the Earth known as?

- (a) Atmosphere
- (b) Hydrosphere
- (c) Lithosphere
- (d) Chromosphere

2. Which layer of the atmosphere contains the Ozone layer?

- (a) Exosphere
- (b) Stratosphere
- (c) Magnetosphere
- (d) Ionosphere

3. What is the contamination of air by smoke, gases and minute particles known as ?

- (a) Water pollution
- (b) Air pollution
- (c) Soil pollution
- (d) Radioactive pollution

4. What is a mixture of pollutants causing a fog-like haze known as?

- (a) Fog
- (b) Smog
- (c) Smoke
- (d) Dew

5. What is the process of enriching Water with nutrients known as?

- (a) Purification
- (b) Enrichment
- (c) Nutrition
- (d) Eutrophication

6. Which disease is caused by Manganese dust?

- (a) Cholera
- (b) Asbestosis
- (c) Silicosis
- (d) Gout

7. The phenomenon of removal of upper layer of soil by wind or water known as?

- (a) Soil erosion
- (b) Purification
- (c) Eutrophication
- (d) Air pollution

8. The practice of growing the same crop on the same soil year after year is known as :

- (a) Sericulture
- (b) Apiculture
- (c) Monoculture
- (d) Tissue culture

9. What is the layer of the atmosphere rich in ions?

- (a) Stratosphere
- (b) Exosphere
- (c) Magnetosphere
- (d) Ionosphere

10. What is the process of destruction of wastes at high temperature known as?

- (a) Excavation
- (b) Incineration
- (c) Destruction
- (d) Desalination

Edwin Powell Hubble (1889-1953)

Edwin Powell Hubble is a famous name in the field of Astronomy, since the legend, whom we know popularly as Edwin Hubble, is one of the scientists whose contributions played a major role in the field of extragalactic astronomy. Hubble is known for establishing the fact that the universe is expanding. He is known for finding out the fact that the recessional velocity of a body increases with an increase in its distance from the Earth. Due to all these important contributions to the field of Astronomy, we know him as popularly as Hubble, after the Hubble Telescope that has been named to honor him.



Early Life

Edwin Powell Hubble was born on November 20, 1889 to Virginia Lee James and John Powell Hubble in Marshfield, Missouri. He was known more for his athletic abilities rather than the intellectual side. His studies at the University of Chicago were mainly concentrated about Mathematics, Astronomy and Philosophy; however his interest in Mathematics and Astronomy was influenced by George Ellery Hale and Robert Millikan. He obtained his Bachelor's degree in 1910. He was particularly interested in the field of Astronomy. However, he had to keep his words to his dying father and continued studying Law.

At a Later Stage...

When Congress declared war on Germany in 1917, he volunteered to be a part of the US Army. Later, after the end of the war, he returned to America and started serving as an astronomer at the Mount Wilson Observatory near Pasadena. He worked at the Mount Wilson and Mount Palomar observatories where he continued his work until his death. Even, he was the first astronomer to use the 200 inch Hale telescope at Mount Palomar observatory.



Contributions :

- Discovery of the fact that Universe expands beyond the Milky Way galaxy, which he found out using the Hooker's Telescope in Mt. Wilson Observatory, California.
- Introduction of a widely used system for galaxy classification, according to their appearance in photographic images.
- Finding out of the fact that Redshift of a body increases with its increasing distance from the Earth ; Hubble formulated the Empirical Redshift Distance Law of Galaxies, which is currently known as the Hubble's law.
- Discovery of the asteroid "1373 Cincinnati".
- He is also known for writing notable books under the name "The Observational Approach to Cosmology" and "The Realm of the Nebulae".

Hubble's Law :

$$V = H_0 D$$

where, V = Observed Velocity of the body away from us [Unit : km/sec]

H_0 = Hubble Constant [Unit : km/Sec/Mpc]

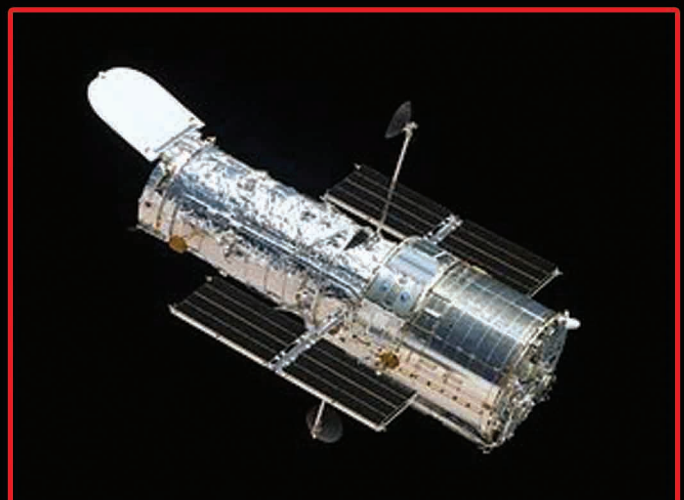
D = Proper Distance to a galaxy which can change over time [Unit: Mpc]

Awards and Honours :

Hubble was conferred on the Bruce Medal, Franklin Medal, Gold Medal of the Royal Astronomy Society and Legion of Merit for several contributions to the field of Science & Technology, especially Astronomy. However, he was not chosen as a recipient of the Noble Prize since Astronomy was not considered to be a branch of Physics. There have been several places and things named after him on his honour.



Asteroid 2069 Hubble

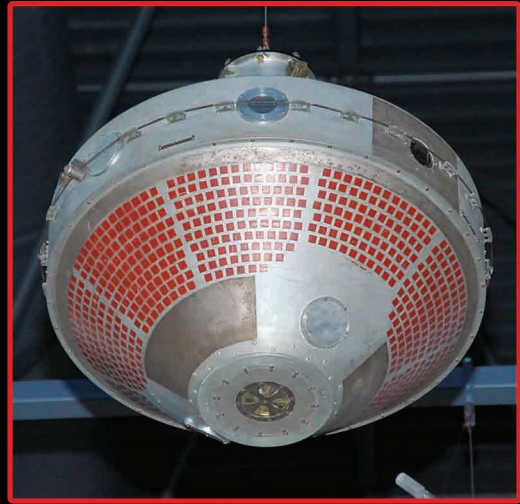


Hubble Space Telescope

Photo Gallery



LANDSAT 7
Launched on 15 April 1999
Earth Observation Satellite



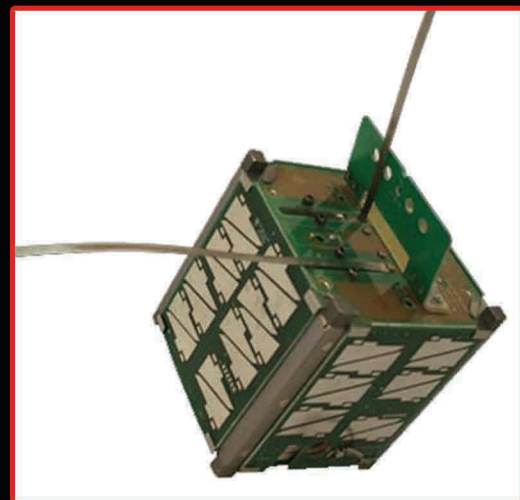
Explorer 8
Launched on 3 November 1960
Research Satellite



BADR 4
Launched on 8 November 2006
Communication Satellite

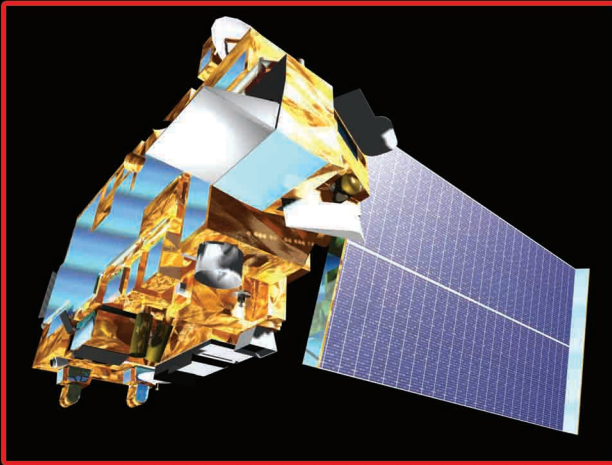


Trailblazer
Launched on 3 August 2008
Military Satellite



Libertad 1
Launched on 17 April 2007
Communication Satellite

Photo Gallery



Terra
Launched on 18 December 1999
Research Satellite



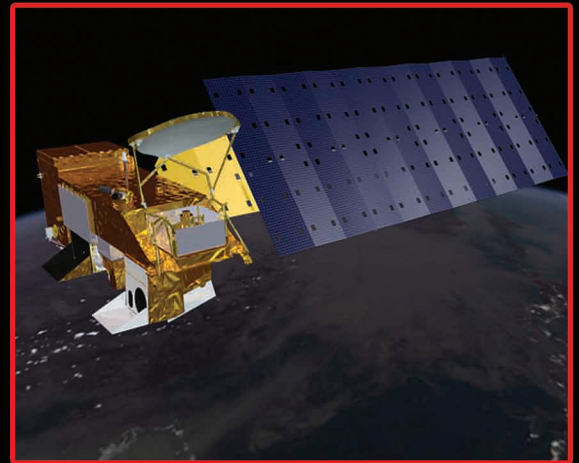
Venesat 1
Launched on 29 October 2008
Communication Satellite



Advanced Composition Explorer
Launched on 25 August 1997,
Space & Solar Exploration Satellite



Gravity probe B
Launched on 20 April 2004
Research Satellite



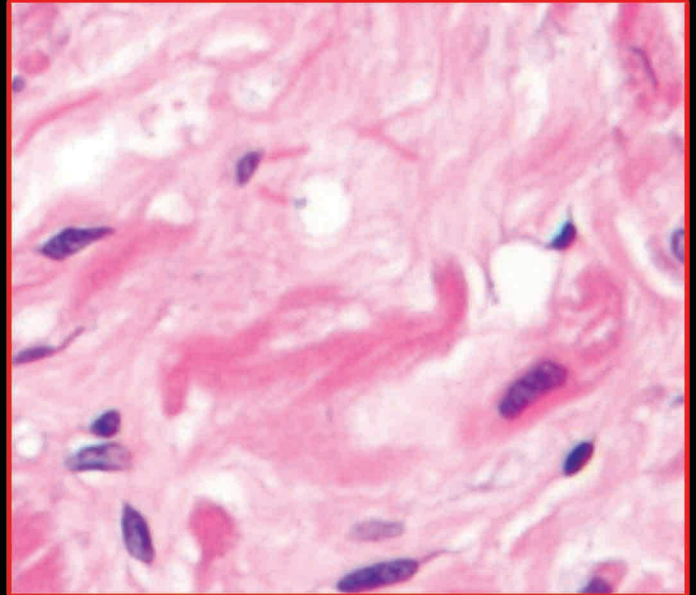
Aqua
Launched on 4 May 2002
Earth Observation Satellite

Acetylcholine

Vagus Stuff- Neurotransmitter from the Vagus Nerve

Vagus Stuff- Why such a name?

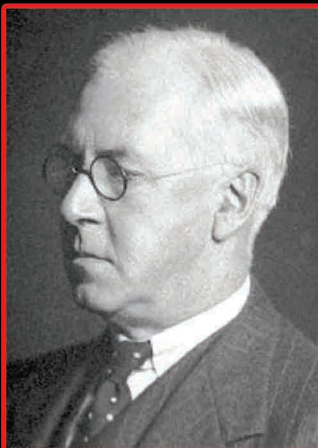
Actually, Vagus Stuff is not the real name given to Acetylcholine. It was given the name "Vagusstoff" which is a German word. In English, this word means "Vagus Stuff", which means the stuff of the Vagus nerve. Such a name has been imparted to Acetylcholine because it is a neurotransmitter which is released by the stimulation of the Vagus nerve and causes a reduction in heart beat rate.



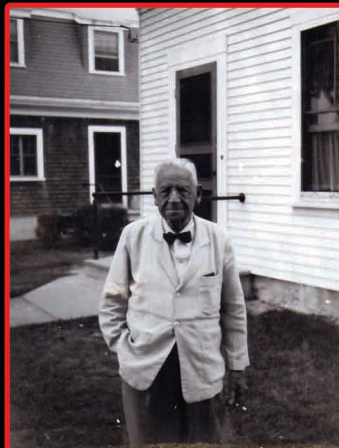
Fibers of Vagus Nerve



Discovery Of Acetylcholine



Sir Henry Hallet Dale

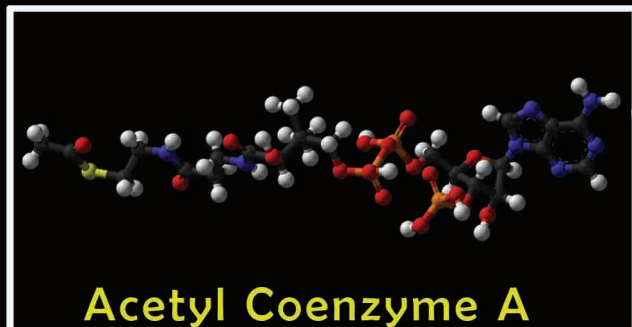


Otto Loewi

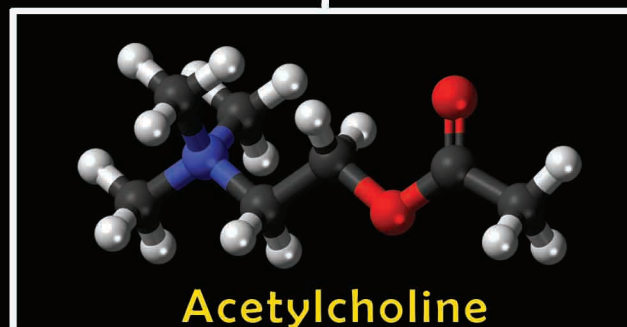
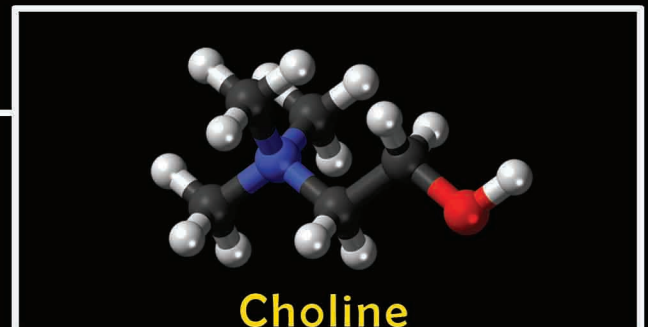
Acetylcholine was first identified in the year 1914 by Sir Henry Hallet Dale for its actions on the heart tissue. In the year 1921, it was confirmed to be a neurotransmitter by the German physiologist Otto Loewi and was named "Vagusstoff" by him. It was the first neurotransmitter to be discovered, which confirmed the chemical synaptic transmission in the body.

Synthesis and degradation of Acetylcholine

Acetylcholine is synthesized in certain neurons by the action of the enzyme Choline Acetyltransferase (ChAT) from the compounds Choline ($C_5H_{14}NO^+$) and Acetyl CoA ($C_{23}H_{38}N_7O_{17}P_3S$). Acetylcholine is degraded to Choline and Acetate by the action of the enzyme Acetylcholinesterase, which is abundant in the synaptic cleft. The degradation takes only 0.01 second, just as the nerve impulse passes through the synaptic cleft.

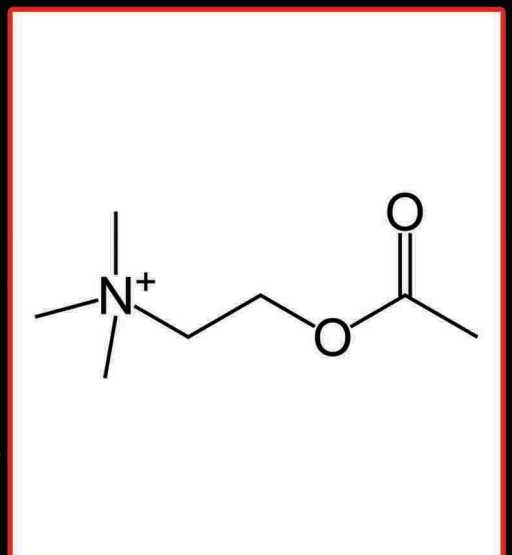


ChAT



Acetylcholine – Its Structure

Acetylcholine is a naturally occurring quaternary ammonium cation ester which contains seven Carbon atoms, seventeen Hydrogen atoms, three oxygen atoms and one nitrogen atom. The Nitrogen atom is covalently bonded with the compound with a coordinate bond, and has four Carbon atoms attached to it. In an apparently straight chained structure of a geometrical isomer of the compound, the second and the third Carbon atoms are bonded with Oxygen atoms. But due to the presence of the coordinate bond of Nitrogen, the molecule gains a slight positive charge.



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