

NOBEL PRIZES IN SCIENCE, 2018

Sultan Ahmed, B.Sc. (H) Zoology, II Year

The Nobel Prize was established by Alfred Nobel (October 21, 1833–December 10, 1896) a famous scientist, inventor, and businessman in his will dated November 27, 1895. His will stated that much of his fortune was to be used to give prizes to those who have done their best for humanity in the field of physics, chemistry, physiology or medicine, literature, and peace. In accordance with his will, the Nobel Foundation, a private institution was established in 1900. The first Nobel Prize for Physics, Chemistry, Physiology or Medicine, Literature, and the Peace Prize were awarded in the year 1901.

PHYSICS

The Nobel Prize in Physics 2018 was awarded “for groundbreaking inventions in the field of laser physics” with one half to Arthur Ashkin “for the optical tweezers and their application to biological systems” and the other half jointly to Gérard Mourou and Donna Strickland “for their method of generating high-intensity, ultra-short optical pulses”. Their inventions have revolutionised laser physics. Extremely small objects and incredibly rapid processes are now being seen in a new light. Advanced precision instruments are opening up unexplored areas of research and a multitude of industrial and medical applications.

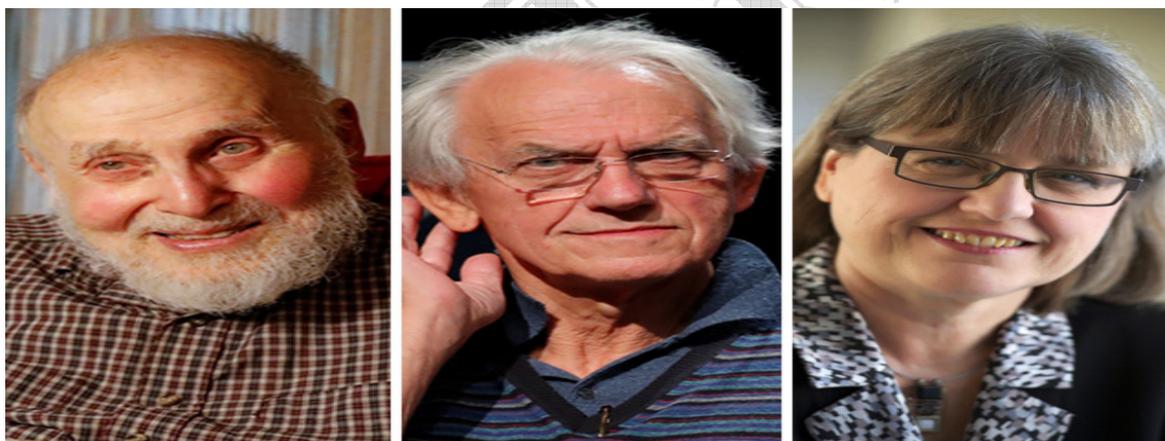


Image: <https://www.wsj.com/articles/nobel-physics-prize-awarded-to-trio-for-laser-work-1538474291>

Arthur Ashkin

Born: 2 September 1922,
New York, NY, USA

Affiliation at the time of the
award: Bell Laboratories,
Holmdel, NJ, USA.

Gérard Mourou

Born: 22 June 1944,
Albertville, France

Affiliation at the time of the
award: University of
Michigan, Ann Arbor, MI,
USA, École Polytechnique,
Palaiseau, France.

Donna Strickland

Born: 27 May 1959,
Guelph, Canada

Affiliation at the time of the
award: University of
Waterloo, Waterloo,
Canada.

CHEMISRTY

The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Chemistry 2018 with one half to **Frances H. Arnold** "for the directed evolution of enzymes" and the other half jointly to **George P. Smith** and **Sir Gregory P. Winter** "for the phage display of peptides and antibodies".

Frances H. Arnold. In 1993, she conducted the first directed evolution of enzymes, which are proteins that catalyse chemical reactions. Since then, she has refined the methods that are now routinely used to develop new catalysts. The uses of Frances Arnold's enzymes include more environmentally friendly manufacturing of chemical substances, such as pharmaceuticals, and the production of renewable fuels for a greener transport sector.

George P. Smith and **Sir Gregory P. Winter.** In 1985, George Smith developed an elegant method known as phage display, where a bacteriophage – a virus that infects bacteria – can be used to evolve new proteins. Gregory Winter used phage display for the directed evolution of antibodies, with the aim of producing new pharmaceuticals. The first one based on this method, adalimumab, was approved in 2002 and is used for rheumatoid arthritis, psoriasis and inflammatory bowel diseases. Since then, phage display has produced anti-bodies that can neutralize toxins, counteract autoimmune diseases and cure metastatic cancer.



Frances H. Arnold,

born 1956 in Pittsburgh, USA. Ph.D. 1985, University of California, Berkeley, USA. Linus Pauling Professor of Chemical Engineering, Bioengineering and Biochemistry, California Institute of Technology,

George P. Smith,

Born 1941 in Norwalk, USA. Ph.D. 1970, Harvard University, Cambridge, USA. Curators' Distinguished Professor Emeritus of Biological Sciences, University of Missouri, Columbia, USA.

Sir Gregory P. Winter,

Born 1951 in Leicester, UK. Ph.D. 1976. University of Cambridge, UK. Research Leader Emeritus, MRC Laboratory of Molecular Biology, Cambridge, UK.

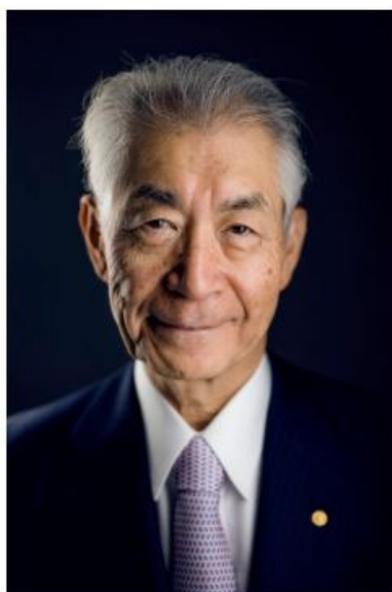
PHYSIOLOGY or MEDICINE

The Nobel Prize in Physiology or Medicine 2018 was awarded jointly to James P. Allison and Tasuku Honjo "for their discovery of cancer therapy by inhibition of negative immune regulation."

James P. Allison studied a known protein that functions as a brake on the immune system. He realized the potential of releasing the brake and thereby unleashing our immune cells to attack tumors. He then developed this concept into a brand new approach for treating patients.

In parallel, Tasuku Honjo discovered a protein on immune cells and, after careful exploration of its function, eventually revealed that it also operates as a brake, but with a different mechanism of action. Therapies based on his discovery proved to be strikingly effective in the fight against cancer.

Allison and Honjo showed how different strategies for inhibiting the brakes on the immune system can be used in the treatment of cancer. The seminal discoveries by the two Laureates constitute a landmark in our fight against cancer.



James P. Allison

Born: 7 August 1948, Alice, TX, USA

Affiliation at the time of the award: University of Texas MD Anderson Cancer Center, Houston, TX, USA, Parker Institute for Cancer Immunotherapy, San Francisco, CA, USA

Tasuku Honjo

Born: 27 January 1942, Kyoto, Japan

Affiliation at the time of the award: Kyoto University, Kyoto, Japan



“THE LIFE-STYLE DISEASES” WE ARE DULY RESPONSIBLE..!!

Sultan Ahmed, B.Sc. (H) Zoology, II Year



Lifestyle disease in onset of Non-communicable Disease (NCD`s). Chronic abnormalities result of the way we are living day today life, so called modern living habits and urbanization.

The major causes which results these disorders are.

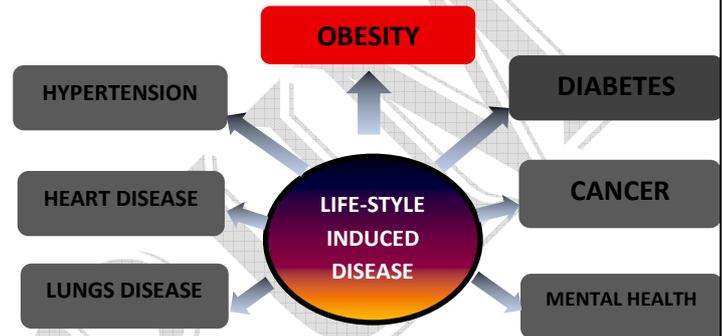
- Unhealthy diets
- Lack of physical activity.
- Stress and inadequate sleeping pattern.
- Smoking and alcohol consumption.

The Unhealthy diets include consumption of **soft drinks** or energy drinks containing too much of unhealthy sugars (containing about 11gm of sugar in 100ml), artificial sweeteners, highdependence on **processed and fast food containing** unhealthy carbohydrates,lots of saturated fats in the form of oil. **Smoking** and **excess alcohol** consumption is catalyzing damage to our body.

Modern high-pressure office jobs, compact life and comfort travelling restricted us to spend whole day on chair and in front of system packed in a room. No **physical activity, even rear exposure to sunlight**(lead to Vit-D deficiency).

All these factors combine to create an unsustainable environment which ultimately leads to diseased condition. Now a days people irrespective of age are developing such disorders. An abrupt increase in young generation i,e with in age of 30 years are being reported. According to WHO,Noncommunicable diseases (NCDs) (mainly lifestyle diseases) kill 41 million people each year, equivalent to 71% of all deaths globally.Each year, 15 million people die from a NCD between the ages of 30 and 69 years; over 85% of these "premature" deaths occur in low- and middle-income countries.Over 61 per cent of all deaths in India are due to lifestyle or non-communicable diseases (NCDs).

Some of common lifestyle diseases are.



Obesity: Having a body mass index (BMI) more than 25 often regarded as obese.Unhealthy eating habits, stressful lifestyleand physical inactivity trigger the obesity. Sometime presence of obesogenic chemicals such as DDT, bisphenol A, MSG and arsenic in the environment were found to be important triggers of obesity. Overweight people suffer from breathing problem, high blood pressure, cardiovascular disease, liver and kidney disorder, diabetes etc. It is known to first step to all other kinds of life style diseases. According to the National Family Health Survey, India ranks seconds with 155 million of obese and this number is increasing at 33-51% every year.

Type II diabetes: The non insulin dependent diabetes mellitus or hyperglycemia occurs in adult, due to poor eating habits and bad lifestyle choice. India has largest number of diabetics with type II at 40.9 million .this number increasing in young age people.

Cardiovascular diseases: Heart diseases, Arteriosclerosis and Hypertension is one of the most prevalent result of lifestyle along with genetic factor. Smoking, obesity, diabetes, high cholesterol, stress are the common reason. Lack of physical activity has been identified as one of the biggest triggers of cardiovascular diseases.

Depression too has been found to be a risk factor for cardiovascular diseases. India has highest number of (atleast 30-40%) cardiovascular deaths happen in age group of 36-64, with 50 and 100 million suffering of heart health issues and Hypertension respectively.

Mental health: More than 10 per cent of the country's population over the age of 18 suffers from various kinds of mental illnesses. The lifetime prevalence of such mental illnesses is over 13 per cent. At least 150 million people in the country, affected by mental disorders, are in need of active medical intervention. Lack of social support, changing diets and economic instability are the main triggers of mental disorders.

Increased intake of sugar, too, has been linked to mental illness. An increase of PM2.5 in the environment by 4.34 microgram/cubic meter can increase the risk of Alzheimer's. These risks, however, have not been considered in the mental health policies such as the Mental Healthcare Act, 2017.

Cancer: Due to stressful lifestyle, commonly used household products including foods contain high amount of chemicals, cosmetics contain cancer-causing compounds and lose of resistance of our body immune system and power of fight against pathogen, or gene mutation may triggers uncontrolled and irregular cell growth leading to tumor and finally cancer. More than 1.73 million new cancer cases are likely to be recorded each year by 2020 in India. It is estimated that up to 20 per cent of cancer cases can be linked to environmental exposures of toxins. Tobacco and alcohol, air pollution and diets rich in meat and low in vegetables, exposure to UV radiation are primary triggers. It includes Oral, Lungs, Liver, Breast, Ovarian, Prostate, Skin cancers. However,

Healthy Dietary Habits

Intake of high carbohydrates, saturated and trans fats, high sugar consumption and sodium (leads to obesity, high cholesterol) can be minimized. **Avoid junk foods and soft drinks.**

these triggers remain largely unaddressed. Moreover, cancer screening and medication remains extremely expensive.

Chronic Obstructive Pulmonary Disease: the permanent obstruction of respiratory pathways. India had an estimated 22.2 million chronic COPD patients and around 35 million chronic asthma patients in 2016. Other than air pollution from vehicles and industry, smoking, global warming also increases risk to respiratory health.

Swimmer's ear: using headphone constantly and are exposed to loud sounds results the swimmer's ear. It causes inflammation, irritation or infection in the auditory canal.

Cirrhosis: It is a group of liver disorders. Liver being major site of metabolism and detoxification can be severely affected by heavy alcohol consumption and hepatitis. Cirrhosis is increasing significantly as people are consuming lots of alcohol on daily basis to deal with stress.

TOP 10 CAUSES OF DEATH

	% of total deaths	% change 2005 to 2015
Heart attack/failure	16	+17
Lung disease (COPD)	10	+4
Stroke/brain hemorrhage	8	+7
Bronchitis/Pneumonia	5	-23
Diarrheal diseases	5	-32
Tuberculosis	5	-31
Diabetes	3	+35
Chronic kidney disease	3	+21
Preterm birth	3	-40
Road injuries	3	-3

<https://timesofindia.indiatimes.com/india/Whats-killing-Indians/articleshow/54930853.cms>

HOW TO DEAL WITH "LIFESTYLE DISEASES"...

Can we prevent it...??? Yes..we can prevent it up to a greater extent.

- ✓ To wash out toxins from your body it is essential to drink at least 8 to 10 glasses of water every day. This will also help in keeping your body hydrated and your metabolism high.
- ✓ Intake of dry fruits like almonds, raisins, and walnuts as an option for a healthy quick snack. Add fresh soups for dinner,

including salads and fresh fruits during the day.

- ✓ Include egg whites, lean meat and fish to add sufficient proteins to your diet. Add fiber rich foods like oats and fresh fruits and vegetables to your diet for a healthy heart and easy digestion.
- ✓ Include cereals in your breakfast to get a complete dose of fiber in your diet.

Skipping meals mean that you will end up snacking on junk foods which are not good for your body. Hence to stay fit and healthy do not skip your meals.

Workout and Physical Activity: Now days apart from the gym, many other forms of workout are available, like Swimming, Yoga and aerobics or an outdoor sport. Choose the one that fits to taste and indulge in some form of workout at least five times a week for minimum 40 minutes. Also, try

to walk as much as possible during the day. If your work is a sedentary type, try taking a walking every two hours for five minutes. Instead of lifts, use stairs and park your car away from the office so that you can walk a little extra.

Get Adequate Sleep: To get your body work in complete harmony, one should sleep for 8 hours every day. Sleep also helps in maintaining a sharp mind and keeps you refreshed.

Manage Stress: Stress is another cause of many diseases, hence avoid stress. Manage your stress by reading books, meditation, and yoga. You can also manage your stress by indulging in some of your hobbies.

Quit Smoking and Alcohol Abuse: Smoking is a known cause of cancer, hence quit smoking. It is also said to block arteries and reduce blood flow. Excess alcohol consumption can rise in blood pressure, cause liver and kidney disorders.

LET'S LIVE A HEALTHY LIFE.....

SPECIAL

CONSERVATION OF INDIA'S BIODIVERSITY: NEED OF THE HOUR

Dr. Ragesh P. R. Asst. Prof. Department of Zoology

Planet earth is currently contains several millions of species belonging to about 100 different phyla (Dirzo and Raven 2003). The existence of varieties of these species on earth is known as biodiversity. It provided the building blocks of healthy environment that is important for the survival of human beings.

The extermination of biodiversity irreversibly alters our environment. Humans are connected with and depended directly or indirectly on the other species for survival. For example the pollinators like insect, bats, birds and other animals pollinate more than one third of our crop plants. Without them our species would be deprived of food sources and nutrients. So annihilating them means a suicidal act.

Our beautiful blue planet is experiencing an ongoing sixth great mass extinction process. This phenomenon is a natural process., earth had already experienced 5 great mass extinction in the past and it occurred roughly in every 26-30 million years (Raup and Sepkoski, 1984). Sadly the ongoing extinction is not natural but man made (Vignieri 2014). Currently our plant is losing species at alarming rate, 1,000 to 10,000 species a year. Globally the population of fishes, amphibians, reptiles, birds, and mammals have declined 58% in between 1970 to 2012 (*Living Planet Report 2016*). This data only tells about the loss of vertebrate but if we count the loss of invertebrates then the rate would be more terrifying.

India is considered as mega diverse country. Area wise it occupies only 2.4% of land area of our planet but contains 7-8% of all recorded species, including 45,000 species of plants and 91,000 species of animals. It accounts 4 of the 34 globally identified biological hot spots. The Himalayan's, The Western Gats, The Northeast and The Nicobar islands (IUCN India Factsheet 2018). However, over the las 200 years India has suffered huge reduction in its biodiversity. Few animals like, Indian Cheetah, Sumatran Rhinoceros become extinct, some wild animals like, Dangs, Giant squirrel, Ganges river

dolphins, Purple frog, birds like Himalayan quail, Bengal vultures, Great Indian bustard become extinct locally in India. According to the Red list of International Union for Conservation of Nature (IUCN) released at Rio + 20 Earth summit in 2012 there are 132 species of plants and animals are critically endangered in India (Sudhi, 2012).

If this trends continues, by the end of 2050 India will going to loss many of it's species. That means there will be no untouched wildness, magnificence of mountains, rain forest, beautiful beaches are left for our future generation to see, experience and communicate. Therefore, it is the duty of the state and citizen to conserve them and it is the high time to take probable actions for effective the conservation of India's biodiversity.

Major threats to biodiversity

Threat to India's biodiversity are loss and destruction of habitats, hunting and illegal trade of wildlife derivatives, spreading of invasive species, unsustainable use of natural resources and development, pollution of air, water and land and global climate change.

1. ***Loss and destruction of habitat:*** India's spectacular wildness are shrinking, fragmenting and pushing the species into the brink. The conversion of forest to agricultural fields, roads, housing, industrial, hydroelectric and other projects are the main culprits. Over the last 30 years 14,000 sq.km. of India's forest have been converted for industrial, infrastructure projects, like dams, mining, power plants, high ways etc (Shrivastava and Kothari 2012). That means approximately 250 sq.km. of forest area felled every year. The destruction and loss of habitat has severely affected the animal populations

of India. This will ultimately led to the human animal conflict and local extinction.

2. **Hunting and illegal trade of wildlife**

derivatives: Another reason for the declining biodiversity of India is hunting and illegal trade of wildlife derivatives. Animals like, tigers, leopards and otters are hunted for their pelts, star tortoise for pet markets, bran owls are for black magic rituals, rhinos are for their horns, elephants for their tusk, pangolins are for their scales and meats etc. Thousands of these animals are killed to meet the demand in International markets in Far East and South East Asia (Bindra, 2017). Illegal logging in forest and over exploitation of medicinal plants for pharmaceutical industries contribute excessive loss of floral diversity in India.

3. **Spreading of invasive species:** Invasion of alien species in the forest, cultivated and non cultivated lands is a major threat to the biodiversity of India. Invasive species have flourish in an area at the cost of local species. The introduced species lack natural enemies in new area therefore their growth and propagation would be higher as compared to their native place. Certain physical and chemical features of these plants would help them to replace or exterminates the local species.

4. The invasive species are introduced deliberately or accidentally. For example the Mexico origin of Mesquite (*Prosopis juliflora*) introduced in India in 1857 to reclaim the saline and alkaline soil. This species is now widely distributed all over India and were dominated over the local plant species. The exotic plant *Lantana camara* has been taken the floor of India's rich forest and causing severe threat to the native plant and animal species. This species was introduced to India from Mexico as an ornamental plant. The weed *Parthenium hyderphorous* introduced to India accidentally along with a consignment of wheat from United States. Now it spread over large area of India's cultivated and non cultivated land at the cost of native species.

The exotic trees like, *Eucalyptus* has been planted in India deliberately for commercial purpose by replacing our indigenous plants. Invasive species directly annihilating the native species and thus killing the local ecosystem.

5. **Unsustainable use of natural resources:**

Rapidly growing population in India, changing consumption patterns particularly the natural resources, would cause major impact on its biodiversity. For sustaining the large population country needs large amount of energy, minerals, water and other natural resources. The high demands will speed up the over exploitation of the natural resources. The growing pressure on natural resources has fuelled the de notification of some countries protected areas to permit exploitation of natural resources. Commercial demand of wood in paper and timber industries led to the depletion of India's forest. The uneven consumption pattern and population growth lead to the over exploitation of natural resources ultimately causing the depletion of countries biodiversity.

6. **Pollution of air, water and land:** According to WHO (1992) and National Geographic Society (1995) over 100 Indian cities dump the untreated sewage directly into the river Ganges. The untreated sewage is the major cause for the pollution of India's major rivers, lakes, ground and surface water. Air pollution is country's another silent killer. Pesticides and fertilizers used in the agricultural fields are polluting countries soil, river, lakes and ground water. Solid garbage from cities, chemical effluents from the industries and other industrial wastes are the major contributors of environmental pollution in India (Preethi et al. 2018). The pollution of the rivers and wet lands reducing the population of critically endangered species like Gharial, Gangetic dolphins and Pink-headed duck. A high level of pesticides residue have been found in Sarus cranes and collared doves and few rock pigeons in Keoladeo National Park in Rajasthan (Muralidharan 1993). Noise

pollution, due to running vehicles, blowing of horns and associated vehicular sound changes the mating and breeding behaviour of frogs, birds and other animals (Bindra, 2017).

7. **Global climate change:** Changing climate has profound effect on India's biodiversity. India have been witnessing the changing global climate severely. Scorching heat waves blew in summer of 2015 took the life of 1,500 people, extreme weather patterns like the floods of Kerala 2018 or sudden storms in costal Orissa, Andra and Tamilnadu, drought in Maharashtra have become regular. India's costal areas and low land areas are at the risk the flooding and submergence, which will suffer high reduction in biodiversity. The Himalayan glaciers which feeds the major rivers of northern India are melting fast at alarming rate. If this pattern continues all glaciers will disappear at the end of this century (Azam et al. 2018; Buri and Pellicciotti, 2018). This will cause a major impact in India's biodiversity, as the glaciers are highly relevant water sources in northern plain of India.

Need for conserving biodiversity Biodiversity directly benefited to the survival of our species on earth. The direct benefits are: provides biological resources, ecological services and social as well as spiritual (Kearns, 2010).

1. Biological resources: Biological resources are those products, which harvest directly from the nature. These are categorised into food, medicines, diners, wood product etc. Majority of India's population depends on its biodiversity for their livelihoods and medicines. Our country is earning revenue from exporting the marine products.

2. Ecosystem services: Ecosystem services defined as the processes provided by the nature to support the human life on earth. The pollination, decomposition of waste, water purification, renewal of soil fertility and control of floods are fall under these categories. The service of biodiversity is crucial for the economy of India. The pollination services performed by the insects

alone costs more than Rs. 18900 billion per year. India's forest neutralising more than 11% of countries greenhouse gas emission. According to our ministry for environment and forest 2009, the value of this service would be Rs. 6,00,000crores. Similarly, the mangrove forest serve as sponge by absorbing excessive water during wet season and releasing water slowly in dry season. The wet lands and riparian plants act as filter absorb nitrogen and traps sediments, thus purifying the surface and ground water. Unfortunately, the illegal constructions and unscientific developments are disrupting the nature. Due to this we are now depended on artificial filters for which we are paying high and we forgot the free service of the nature.

3. Social and spiritual benefit: Biodiversity has played a crucial role in the cultural evolution of humans. The heterogeneity we observed in India's mythology, folks dance and folk arts are directly or indirectly derived from the nature. According to Indian culture certain plants and animals are sacred and worshiped by people. Indian culture is deeply integrated with its rich biodiversity. It provide a sense of place. So depleting biodiversity is also a major concern in India on religious perspective. For example the reduction of vulture population forcing the Parsi community to change their mourning ritual. Parsi community follows Zoroastrian faith, the dead body is offered up for a sky burial where the flesh is consumed mainly by vultures.

Role of media in biodiversity conservation

Media has to play an inevitable role in the conservation of biodiversity. However, the impact on biodiversity in India doesn't get much attention it deserves. The rapid reduction of biodiversity ultimately effect the humanity, especially for people who's livelihood is directly linked to nature. The integrity of challenge of sustainable use of natural resources by humans are large. In this scenario our media has a role to play in raising awareness of these issues and allowing the citizens, policymakers and other stakeholders to debate and found out new solutions. Sadly, the current coverage of media

about the importance of biodiversity and its conservation has limited.

Similarly, the social media can be effectively use for the conservation of biodiversity in India. Social media has become a integral part of Indian society. At least 25% of Indians are actively using social media. By conveying the information about the various crisis of biodiversity, we can strengthen our conservation efforts and formulate better policies for effective conservation of India's biodiversity (Behra 2015).

Conclusion

India is considered as rich country in terms of its biodiversity. The country contains 4 out of 34 globally identified hotspots. We Indians are boasted our rich biodiversity. Despite of the growing population India has retained few

species extinct out from other countries. However, today the coin has turned other side. India's rich biodiversity is depleting rapidly than ever. Urbanization producing tonnes of garbage that eaten up India's cities. Huge sewers reduced life giving rivers, industrial, household and vehicular pollution pollutes air. Climate change brings extreme weather events in country. Ancient forest of India are stripped, its vast wet lands and open spaces are being encroached for development. Many of its rare plants and animals are facing brink of extinction. India cannot afford the loss of its rich biodiversity. It is a major concern of people those who directly depend on the nature. So it is the fundamental duty of both government, media and citizens of India to formulate efficient strategies for effective conservation of biodiversity for our future generations.

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VIRUS INVISIBLE TO IMMUNE SYSTEM

AreebaUsmaniB.Sc. (H) Zoology, II Year

Our immune system is great at protecting us from the germs that surround us everyday — but every machine has its kinks.

One gene, which protects the body from autoimmune disorders (in which the body attacks itself), also helps secretly usher in viruses by making them undetectable. But how the story ends depends on how much virus is trying to get in, according to a new study published in the journal *PLOS Biology*. This gene, called the adenosine deaminase acting on RNA 1, or ADAR1, protects the body from large amounts of the virus, but scientists found ADAR1 invites it in if only a small number of viruses knock on the door. ADAR1 and the protein that it codes for, protects the body from attacking itself by finding and unzipping double-stranded RNA, a genetic relative of DNA, into single strands. It's unclear why double-stranded RNA activates the immune system in the first place, but it could go back to the origins of very early life on the planet, said senior author Roberto Cattaneo, a professor of biochemistry and molecular biology at the Mayo Clinic in Rochester, Minnesota.

One theory holds that primitive cells only held RNA as genetic material. Eventually, however, cells began using DNA, while viruses predominantly began encoding genetic. So "cells began to build up an innate immune system to defend themselves and to recognize double-stranded RNA as an intruder,". When the ADAR1 gene is defective, it can't transform some double-stranded RNA produced by the body into single-stranded RNA. The untouched double-strands then activate the immune system and can lead to

an autoimmune disorder that affects infants called Aicardi-Goutières syndrome. This severe disorder causes problems in the brain, the immune system and the skin, according to the National Institute of Health. But "patients who have a defect in this protein...in fact combat viruses pretty well," Cattaneo said.

Cattaneo and his team used the powerful gene editing tool CRISPR-CAS9 to delete ADAR1 in human cells in the lab, while leaving other cells intact. They then infected cells with either the functioning gene or the deleted gene with different amounts of a measles virus. (The measles virus stores its genetic information in RNA instead of DNA. And though the virus usually makes single-stranded RNA, it can make mistakes and form some double-stranded copies as well.) The team also infected the cells with a mutated measles virus that carried more double-stranded RNA and watched what happened. They found in the cells without ADAR1, even a small amount of double-stranded viral RNA activated the immune system. Cells with a functioning ADAR1 edited the double-stranded RNA, as expected. In these cells, they found the threshold for activating the immune system's alarm bells is about 1,000 snippets of double-stranded viral RNA. More than this and the immune system notices the virus. Measles is not the only virus that can hijack the immune system, and Cattaneo said he hopes to determine the activation thresholds for other viruses, such as the yellow fever virus and the Chikungunya virus. Modifying the threshold could potentially lead to antiviral treatment options, Cattaneo said.

GENETICALLY ENHANCED HUMANS

Maitreyi Kaushik B.Sc. (H) Chemistry, III YEAR

Genetic engineering also called genetic manipulation, is the direct modification/ manipulation of an organism's genes using biotechnology, i.e., it is the ability to add or remove DNA from an organism to change specific traits (character). This has been used for years to enhance agriculture and treat diseases, but a new technology: the CRISPR-Cas9 gave protein complex which makes it possible to add and remove genes with unprecedented speed and precision. This brings many capabilities closer to reality. Now, scientists are testing whether gene editing can help treat diseases such as HIV and hemophilia. CRISPR opens doors for human enhancement like adding genes for bigger muscles or whiter teeth. No laws regulating gene editing

have been set for now because the technology has not been fully developed yet and once legislated it will be very hard to unlegislate.

Chinese scientist “ Jiankui He” genetically engineered human embryos- resulting in the first ever birth of genetically altered babies; they are twin girls whose genomes have been tweaked to resist HIV. This news evoked disgust, anger and fear amongst many in the scientific community as the produce was considered unsafe and unsupervised. However, the gene technology is here to stay and experts are wrestling with the ethical implications of gene editing and making recommendations.

RAMSAR SITES; PRESERVATION OF ECOLOGICAL CHARACTER

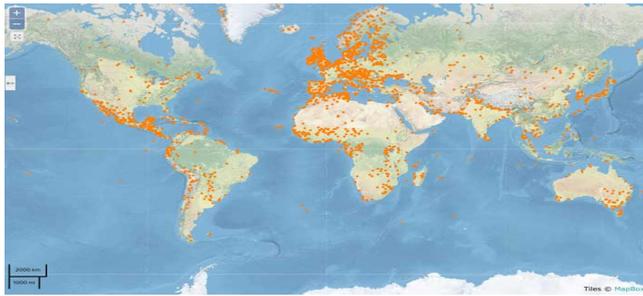
Aadil Ashraf, B.Sc. Botany (H) II year

The Ramsar sites are the wetland sites that are designated to be having an international importance. The sites acquire a national and an international value not only in the country or countries in which they are located but also for the humanity as a whole. Wetlands are considered to be indispensable and vital for human survival. They are amongst the world most productive environment; cradles for ecological diversity that produces enormous amount of biomass onto which countless species thrive.

Managing wetlands and sustaining them become a global challenge due to human intervention and as nongovernment bodies and also supports the private sectors.

a result of which the services that wetlands provides are being compromised, so as to protect the wetlands an intergovernmental treaty was established on 2nd February 1971 that came into force in 1975 and was named as Ramsar convention as it was signed in Ramsar state of Iran. It provides a legal framework for the conservation and head piece use of the wetlands which are of international importance especially as waterfowl habitat. About 170 parties participated and signed till now in the convention. Ramsar is one of the many multilateral environmental treaties, as it works with six other relevant global treaties,

There are currently about 2,200 Ramsar sites around the world The world Ramsar Sites..



<https://encykorea.com/world-map-of-wetlands/map-world-wetlands-ideal-world-map-of-wetlands/>

There are 26 Ramsar sites are present across the country.



<https://i1.wp.com/www.civildaily.com/wp-content/uploads/2016/04/Wetlands-map-India.gif?ssl=1>

According to WWF-India loss in vegetation, salinization, excessive inundation, water pollution, invasive species, excessive development and road building all have damaged the country’s wetlands.

There is a sincere need to protect these sites as well as rehabilitating the local wetlands as well which are being deprived by our own actions. Governmental and nongovernmental agencies should also take appropriate measures regarding this context to enhance the condition of the depriving wetlands.

At present west Bengal government has given its approval to state forest department to apply for coveted Ramsar site recognition under Ramsar convention to Sunderban forest. Once it is conferred Ramsar site status, Sundarbans reserve forest will be the largest protected wetland in the country.

DEVELOPMENT Vs ENVIRONMENT

Aditi Singh Pal, B.Sc. (H) Botany, I Year

From steam engines to bullet trains, from letters to e-mails, I must say we all have come a long way in terms of “development”, But at what cost? While on one hand we are building skyscrapers and multiplexes, on the other we are polluting the environment. Recently, an internet survey gave us a major throwback on our continued deteriorating air quality index: Today, situation is such that in race of having better life we have lost quality of life.



<https://www.scoopwhoop.com/10-year-challenge-on-india-and-the-world/#.vnx89f61u>

There's no doubt about the fact that economic progress holds great importance in development of a country but compromising with natural equilibrium has its own consequences.

According to a report by the Energy Policy Institute at the University of Chicago (EPIC), air pollution in the national capital has reduced life expectancy by more than 10 years. In the past two decades, states the study, the concentration of fine particulate matter increased by 69 per cent on an average across India, reducing life expectancy by 4.3 years compared to 2.2 years in 1998. Not only air is affected, the water reserves are also under the global pollution radar. More than 70% of the fresh water in liquid form of our country is converted into being unfit for consumption. Not only India, but other countries are also suffering from the same problem throughout the Globe.



1,<https://qz.com/india/1466263/photos-of-indias-chhath-puja-in-delhis-polluted-yamuna-river/>

2,<https://abcnews.go.com/beta-story-container/International/toxic-foam-pollutes-indias-sacred-yamuna-river/story?id=57995346>

CHHATH 2018: People taking a dip in polluted Yamuna River water. The images appear to show a snow-covered river.

We may have revolutionised our technologies to expand the industries but proper waste disposal system remains to be an issue. Which ultimately destroying the beauty of nature

The reality is that stretches of one of India's most sacred rivers, the Yamuna, are covered with toxic foam caused by industrial waste. Groundwater reserves are also under pressure as the global population explodes. The future generations face an environmental 'time bomb' as quality of air and water deteriorates, natural resources get exhausted and animals soon become extinct. In the name of economic progress, we humans have only harmed the nature. We have ignored the fact that if nature can give us then it can take it too. The recent climate changes and increased number natural calamities are only a trailer of "wrath of Mother Nature", if don't take required steps immediately, soon our earth would be a history.

A successful economic development strategy must focus on improving the skills of the area's workforce, reducing the cost of doing business and making available the resources business needs to compete and thrive in today's global economy. Someone has rightly said, "The planet is just too small for these developing countries to repeat the economic growth in the same way that the rich countries have done it in the past. We don't have enough natural resources, we don't have enough atmosphere. Clearly, something has to change."

An HIV Cure by 2020!!! A Review of the Future of HIV Therapy

Saniya, B.Sc. (Hons) Zoology I year

HIV research has come a long way since the disease was discovered in the 1980's. Antiretroviral therapy was a major milestone that has changed the lives of millions, but the goal now is to find a HIV cure before 2020.

The human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) is one of the most serious contemporary sexual health related issue affecting the human race today. Infection with HIV usually has a huge physical, mental, social and economic impact on infected individuals, their families as well as the community in which they live.

therapy or "the cocktail." It also has a longer name: antiretroviral therapy (ART) or highly active antiretroviral therapy (HAART).

There have been improvements on antiretroviral drugs to reduce their dosage, and HIV vaccines are underway, but an HIV cure has remained elusive.

The year 2020 will bring us close to the 50-year mark after HIV was first described. Several organizations are pushing the development of a first functional cure — one that leaves people living with HIV healthy and medication-free without necessarily wiping the virus completely — to 2020.

But how close are we to reach this goal? Lets have a look at the most advanced strategies to make a functional HIV cure.

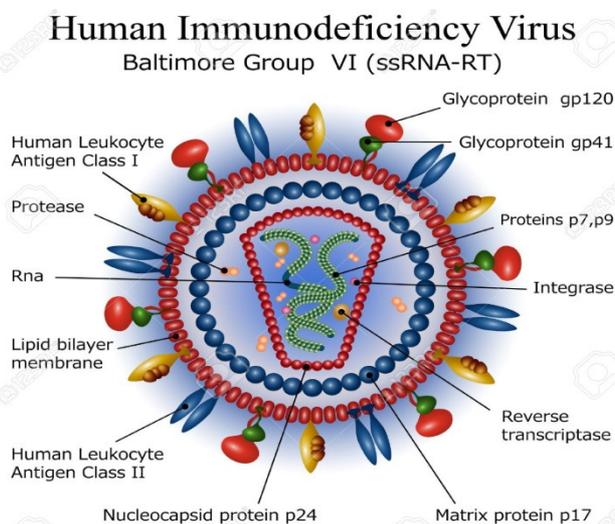
Stopping the replication of HIV

One of the most advanced HIV treatments seeks to inhibit the virus' ability to replicate its RNA and produce more copies of itself and although it doesn't get fully rid of the virus, it can stop its spread.

The French company Abivax showed last year in a clinical trial that this approach has the potential to become a functional cure for HIV. The key to its potential is that it can target the reservoir of HIV viruses that "hide" inactive within our cells.

"Current therapies suppress the virus in circulation by inhibiting the formation of new viruses, but they don't touch the reservoir. Once you stop, the virus comes back in 10-14 days," says Hartmut Ehrlich, CEO of Abivax.

"ABX464 is the first drug candidate ever shown to reduce the HIV reservoir.



https://www.123rf.com/photo_26111982_diagram-of-hiv-virus-particle-structure.html

There are many treatments that can help people with HIV. As a result, most people with HIV are living long and healthy lives. Treatment is recommended for everyone with HIV infection, and generally should be started as early as possible. Medicines slow the growth of the virus or stop it from making copies of itself. Although these drugs don't eliminate the virus from the body, they keep the amount of virus in the blood low. This protects the health of the person with HIV and also can prevent HIV from passing to sex partners.

Most people who are getting treated for HIV take 3 or more drugs. This is called combination

”The company is now planning a Phase 2b clinical trial to confirm the effects of the drug in the long term.

“We will follow about 200 patients for 6 to 9 months to find the maximum level of reservoir reduction and how long it takes to achieve it,” says Ehrlich. “That will take us into the first half of 2020, when we could start preparing for Phase 3.”

Immunotherapy

What makes HIV so dangerous is that it attacks the immune system, leaving people unprotected against infections. But what if we could supercharge immune cells to fight back? That’s the reasoning behind immunotherapies.

Researchers in Oxford and Barcelona reported in the year 2015 that five out of 15 patients in a clinical trial were clear of HIV for 7 months without antiretroviral therapy, thanks to an immunotherapy that primes the immune system against the virus. Their approach combines a drug to activate the hidden HIV reservoir with a vaccine that can induce an immune response thousands of times stronger than usual.

While they showed that immunotherapy can be effective against HIV, the results still need to be confirmed, as well as what makes some patients respond while others don’t.

But one of the most advanced immunotherapies at the moment is a vaccine being developed by the French InnaVirVax. The vaccine, called VAC-3S, stimulates the production of antibodies against the HIV protein 3S, making T cells attack the virus.

“Our approach is totally different to other vaccines, which boost an HIV-specific response,” says Joël Crouzet, CEO of InnaVirVax. “We promote an immune recovery, so that the immune system as all the tools to better recognize and eliminate the virus.”

After completing a Phase 2a trial, InnaVirVax is now testing VAC-3S in combination with a DNA-

based vaccine from the Finnish FIT Biotech, which both parties expect could lead to a functional cure.

Gene therapy

It is estimated that about 1% of the people in the world are naturally immune to HIV. The reason is a genetic mutation on the gene that encodes CCR5, a protein on the surface of immune cells that the HIV virus uses to enter and infect them. People with this mutation are missing part of the CCR5 protein, making it impossible for HIV to bind to it. Zinc finger nucleases to edit their DNA to make them resistant to HIV.

Sangamo reported in 2016 that four out of nine patients treated with this gene therapy in one of the arms of a Phase 2 trial were able to remain off antiretroviral therapy with undetectable levels of HIV, and full results of the trial are expected this year. In the future, gene therapy for HIV could be done with CRISPR, a gene editing tool that is much easier and faster to make than previous gene editing tools. Not so far in the future, HIV could become one of the first diseases to be cured with CRISPR.

When will we have an HIV cure?

Although there are several approaches that could eventually bring a functional HIV cure, there are still some challenges ahead. One of the biggest concerns around any HIV treatments is the virus’ ability to quickly mutate and develop resistance, and for many of these new approaches there is still no data on whether the virus will be able to become resistant. So far, none of these functional cures have reached late-stage clinical testing, meaning it doesn’t seem likely that we will meet the goal of having an HIV cure by 2020. However, that year will likely mark an important milestone as the first late-stage trials are due to start that year.

(Source; This information is taken from a article by Clara Rodríguez Fernández which is in LABIOTECH.eu originally published in September 2016 authored by Evelyn Warner.)

MICROPLASTICS

Palak Jain, B.Sc. (H) Chemistry, III year

The threat of nuclear plastic (NP's) is one of the most hazardous and the biggest problem of today's hour. The presence and effects of plastic debris been increasingly investigated. The majority of the study focused on microplastics (MP's) suggests that they have also harmed aquatic environment and further to humans. It is also an undenied fact that plastic products can be found in several fields such as health, construction and textiles. This lead to an increase in the global production of plastic. It has raised tremendously in the recent years that is from 1.7 million in 1950s to over 322 million tons in 2018.

Concerns about toxic impacts of MPs and eventually NPs for human health have raised, but the investigations are still sparse. It has widely

studied and observed that there are various routes of exposure to MPs like it could be orally through drinking water, etc. the presence of MPs in soil and freshwater ecosystem is the most basic route that one could go through.

Adverse effects from MPs and NPs may result from a combination of the plastic's intrinsic toxicity, chemical composition and ability to absorb, concentrate and release environmental pollutants. Since MPs have been detected in various trophic levels, additional studies need to evaluate the bioaccumulation of absorbed contaminants and eventually biomagnification, which is harmful and eventually affects human health.

TARDIGRADE: THE TINY BUT INDESTRUCTIBLE LIVING AROUND US

Hrituraj Dey, B.Sc. (Hons) Zoology I year

When it comes to strong and resilient, we generally think of big, massive animals like a lion hunting a buffalo or an orcas taking down a whale. While all of these and others are expert in their field, there is another animal which leaves all the others behind, when it comes to sheer survival. It's called the '**Tardigrade**' with a plump body having eight legs with pointed claws and a sucker-like mouth with dagger sharp teeth measuring only a millimetre long. They are strangely cute, earning the other names which are '**Water Bears**' or '**Moss Piglets**'.

Tardigrades can be found almost anywhere, from Antarctica to your own backyard. Some of them live completely in water, while others are terrestrial and exist in damp vegetation and soil. They suck the juices from algae, lichens and moss and some species are carnivores and even cannibals. What make them special are their unusual survival skills.



https://www.macleans.ca/?dpsfa_article=even-30-years-of-deep-freeze-cant-stop-the-water-bear

Tardigrades will outlive all the other beings, including us humans. They can endure extreme conditions that would kill many other animals. One common problem terrestrial tardigrades experience is dehydration. They need at minimum a very thin film of water to function, but the long

term absence of water isn't necessarily a death sentence for them as it is for humans and many other animals. They can be revived after years of drought. Just add water and they are good to go!

Tardigrades also don't easily freeze to death. According to an American Science article, '*they have survived temperature of -200°C at long term storage for 20 months*'. In addition, tardigrades can withstand high temperatures and have lived after being '*exposed to 150°C*' according to the American Scientist report. If freezing and boiling them weren't enough, scientist tested the toughness of tardigrades in other extreme ways. They tried to crush them with high pressure.

A Live Science article reports that '*tardigrades can withstand pressures up to 87000 pounds per square inch*'. It also noted that '*just half this pressure would kill most other organisms on Earth*'. One of those organisms would be humans. And then the scientist hit them with high levels of X-rays, gamma rays, and other types of radiation. Researchers found that some can survive radiation doses of 5000-6000 grays. Once again tardigrades prevail where humans easily fail. We sicken and die after exposure to significantly lower levels of radiation which is only 0.7 grays under certain conditions and 10 grays is the LD (lethal dose) 100 that is necessary to kill 100% of the exposed population. These tiny animals have also faced the final barrier – outer space.

In 2008, researchers sent a group of living tardigrades on the outside of rocket to orbit the earth. When the water bears returned to Earth, scientists found that 68 % of them lived through the ordeal. Sounds pretty tough animal, even if it looks like a chubby, eight-legged gummy bear. This led to an enormous speculation that tardigrades are extraterrestrial beings. While it can be thought, but at the same time scientific evidence places their origin firmly on Earth, where they have evolved over time. In fact, this evolution has given rise to over 1000 known species of tardigrades.

Undoubtedly, tardigrades have an amazing survival skill that helps them to survive in conditions that are inhospitable to most life on earth. If necessary to save their lives, tardigrades enter a state that ironically mimics death called '*cryptobiosis*'. In this condition, the metabolic activity of tardigrades gets low as 0.01 percent of normal levels.

What happens to them next depends on what extreme conditions they are subjected to. If the problem they face is the absence of water, tardigrades can undergo a form of cryptobiosis called '*anhydrobiosis*'. Here, the tardigrades curl up, dry out and shrivel into smaller structures called '*tuns*'. Popular Mechanics notes that this state also allows them to endure '*utter vacuum and intense pressure*'. When faced with extreme freezing conditions, tardigrades can undergo another form called '*cryobiosis*'. This state also involves dramatic slowdown of metabolism and the formation tuns. Tardigrades may not live forever, but an amazing by-product of cryptobiosis is that it extends their life way beyond their normally short life spans, which range between 3 months and 2 years. They can live in this state for years or even decades until they are revived.

A Live Science article reports that scientists were able to bring back to life 'two tuns and an egg that had been in cryptobiosis for more than 30 years' in a 2016 experiment. However, tardigrades don't always need to undergo cryptobiosis and form tuns to endure extreme conditions. Researcher Thomas C. Boothby said 'Tardigrades can survive freezing and low oxygen conditions without forming a tun'.

Experiments have revealed that tardigrades can cope with excessive amounts of alpha, gamma and UV radiation even if they're not in the tun state. They have other tricks in order to survive, for instance, they produce high levels of antioxidants to reduce harmful chemicals created by desiccation and high radiation. They also produce a special protein that counteracts DNA damage.



<https://phys.org/news/2016-01-tardigrade-brought-life-frozen-years.html>

Photograph; A Tardigrade brought back to life after being frozen for thirty years

While it may seem that tardigrades can overcome any tough situation, it must be kept in mind that there are some limitations to their impressive resiliency. First, not all tardigrades are extreme survivors. According to reports, marine and aquatic tardigrades did not evolve these

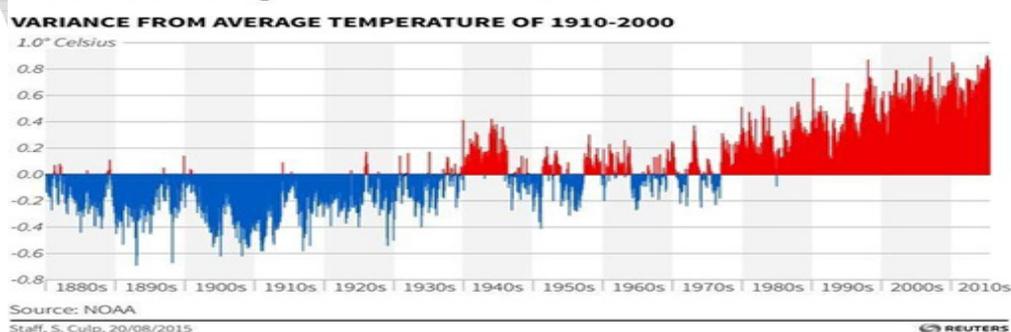
characteristics because their environments are stable. The tardigrades that live in places with highly variable and harsh environmental conditions are the one that possess the extreme survival abilities. Second, tardigrades can't handle absence of oxygen as well, as they can handle other extreme conditions. Depending on the species, they can survive a few hours to up to 5 days in this condition. They will die if oxygen is not restored within that time frame. Tardigrades may not be immortal as individual organisms, but they have a kind of immortality as a group. According to Live Science, they have 'survived five mass extinctions over the course of around half a billion years'. Volcanic eruptions, sudden climate change or possibly an asteroid impact may have wiped out ancient life forms, but tardigrades lived on. Given the great track record of their survival, scientists are optimistic that these little but hardy creatures will continue to exist even after the next mass extinction event. Even the most catastrophic astrophysical events couldn't wipe them out. These robust animals may very well survive until the sun stops shining.

THREATS TO OCEAN; DECLINING MARINE LIFE

KiranYadav, B.Sc. (H) Botany, II Year

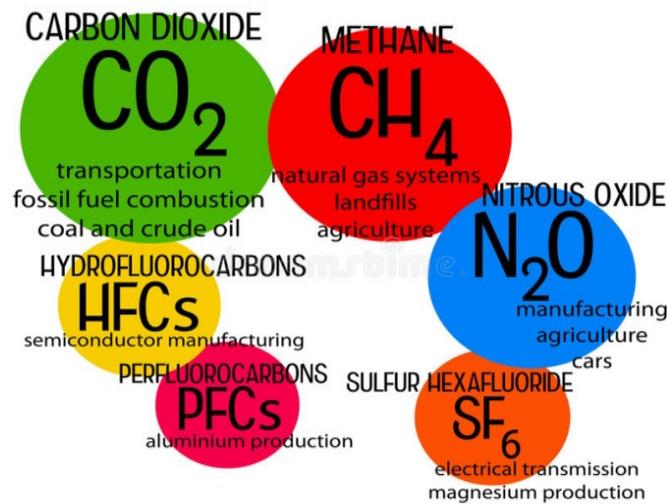
The gradual increase in the overall temperature of Earth's atmosphere due to the greenhouse effect. This effect is caused by increased levels of carbon dioxide, chlorofluorocarbons and other gases in the air, many of them released by human activity.

Global temperature anomalies



<https://www.weforum.org/agenda/2016/01/climate-change-can-we-go-from-words-to-action/>

Due to global warming the concentration of greenhouse gases are increased that leads to rising of ocean temperature by about 1 F, because of enormous quantities of heat are absorbed by oceans. The temperature of the ocean increased at an alarming pace which can be noxious to the marine as well as living being. It can become a huge reason for the ailment of our planets. Hence it is the high time to know, prevent and cure this problem



<https://www.dreamstime.com/stock-illustration-greenhouse-gases-overview-several-types-influencing-global-warming-image47990849>

About 93% of the excess heat from greenhouse gas are absorbed by ocean. "Ocean heating is a very important indicator of climate change, and we have robust evidence that it is warming more

rapidly than we thought," said co-author Zeke Hausfather, from the University of California, Berkeley.

And if nothing is done to reduce greenhouse gases, "models predict that the temperature of the top 2,000 meters of the world's oceans will rise 0.78 degrees Celsius by the end of the century," it said.

<https://www.weforum.org/agenda/2016/01/climate-change-can-we-go-from-words-to-action/>

By CO₂ and that other greenhouse gases must also be limited as they all contribute to ocean warming and hence deoxygenation. The researchers said "Sea level rise includes the effects of thermal expansion, ice melt and storm surges". Ocean acidification (the decrease in pH of the ocean due to its uptake of CO₂). Eminent level of mortalities in marine fishes, sea birds and sea mammal are due to increased level of temperature. Mass movement of species for the search of favorable environmental condition. Coral bleaching due to increment of temperature; it also increases the death rate of Coral reef. Spread of disease in marine species are due to ocean heating.

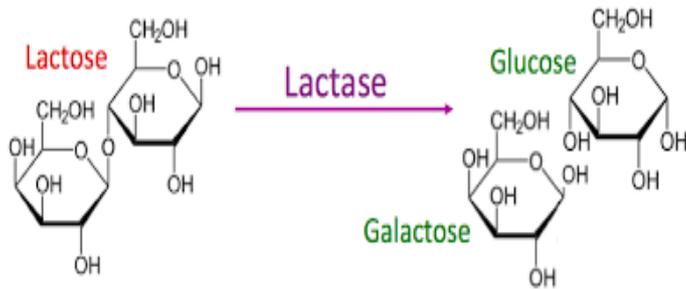
Then, there is a important urge to limiting greenhouse gas emissions to mitigate the problem of increasing global temperature. Thereby restoring marine and coastal ecosystems.

PERHAPS, THIS IS WHY YOU CAN'T DIGEST MILK!!

ShreyaPutatunda B.Sc. (Hons) Zoology I year

Milk is a part of our lifestyle and we extensively consume milk and other dairy products in our food. But many of us are not genetically made for it. Every mammal is brought up by feeding milk

but soon after infancy they stop feeding on milk and depend on other food resources. Their ability to digest milk is gone and lost forever once they reach adulthood.



<https://lbc.msu.edu/evo-ed/pages/Lactase/cellbio.html>

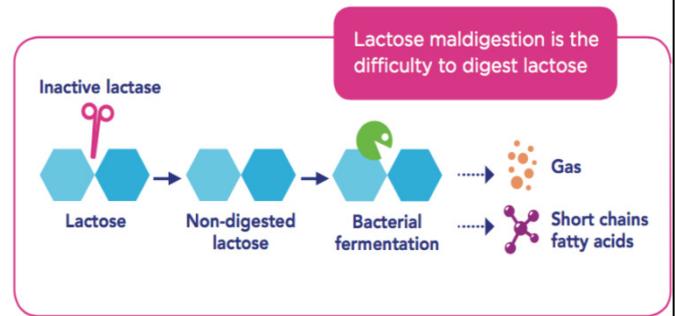


Figure 4. Lactose maldigestion.

<https://www.yogurtinnutrition.com/lactase-activity>

Same goes for the humans as well. We humans have the ability to digest milk during our infancy and it is our sole source of nutrients during our early days. Precisely, it is the production of appreciable amount of lactase that allows us to digest lactose present in milk. But gradually as we grow up we lose that ability or say begin to reflect our lactase non-persistence.

Still there are certain blessed ones amongst us who have evolved to produce active lactase even after childhood and are lactase persistent. The fraction of such people is though quite small.

The key to ability and inability to synthesize enough lactase after childhood lies in chromosome number 2 wherein LCT gene codes for lactase. It shows polymorphism and has various alleles namely- C/T*-13910, G*/A-22018, G/C*-14010, C/G*-13907 and T/G*-13915. Lactase persistence is an autosomal dominant trait and therefore lactase non-persistence is an autosomal recessive trait. A person who is homozygous for the allele corresponding to low activity of lactase has genotype of lactase non-persistence. While a person who is heterozygous i.e. has two alleles-one corresponding to low activity and other corresponding to high activity of lactase even after childhood is a lactase persistent individual. This happens because, as mentioned earlier, lactase persistence is a dominant trait and only one allele is enough to synthesize as much lactase as required for metabolism of milk.

Those who are lactase non-persistence generally show two kinds of phenotype- poor synthesis of lactase precursor or LPH or otherwise ill maturation of lactase even if there is abundance of the precursor. Such people are lactase intolerant and give various degrees of symptoms. If lactose is not digested by lactase then the undigested lactose passes to large intestine and is fermented by microbes housing there. When exposed to lactase, symptoms like nausea, cramping, bloating, diarrhea, and flatulence may arise. But it is not necessary for every lactase non persistence person to give symptoms of lactase intolerance and similarly not very necessary for lactase intolerant person to be lactase non-persistence.

Evolution of LCT to give lactase persistence is recent and is believed to go hand in hand with humans' practice of pasture keeping. There are a few more hypotheses that are also based on natural selection. Lactase persistence is advantageous because people with this trait can nevertheless enjoy protein and nutrients present in milk and other food items with lactose. Lactase non-persistent people are certainly devoid of milk proteins or fail to nourish themselves with food items containing lactose. They perhaps have to depend more on meat, fish and egg for protein enrichment.

THE END OF ANTIBIOTICS

MaitreyiKaushik B.Sc. (H) Chemistry, III YEAR

Antibiotics are a class of drugs used to treat bacterial infections. They were mass produced during the World War II. Now more than one hundred antibiotics have been developed. Doctors depend on antibiotics for treatment of common bacterial infections. These have also contributed to a substantial decline in global deaths like death due to syphilis and tuberculosis. However these are being excessively used in humans and animals and this has led to the development of resistant bacterial pathogens. They are used among animals to 'prevent' diseases and boost their growth. Doctors and scientists have now raised alarm about proliferation of bacterial strains- becoming resistant to more rather all drugs. As a result,

treatment of infections like pneumonia and urinary tract infections has become very difficult. So, patients with drug resistant infections tend to remain hospitalized for longer periods or are likely to die.

No new class of antibiotics has been developed since 1987. Therefore, antibiotics are facing existential crisis. R&D has become slow in producing new and effective drugs, putting the world at the risk of entering into a dangerous era in which routine infections are untreatable. Many organizations and governments are investing billions of money to tackle the problem but many analysts say it's scope and immediacy requires a globally coordinated response.

MOON VILLAGE

Palak Jain, B.Sc. (H) Chemistry, III year

In the recent years, multiple space agencies have shared their plans to return astronauts to the Moon, not to mention establishing an outpost there. Beyond NASA's plan to revitalize lunar exploration, the European space agency and Indian Federal Space agencies have also announced plans for could result in permanent settlement.

As with all things in the new age of space exploration, collaboration appears to be the key to making things happen. This certainly seems to be the case when it comes to the China National Space Administration and the ESA's respective plans for lunar exploration. As spokespeople from both agencies announced this week, the CNSA

and the ESA to work together to create a "Moon Village" by 2020.

The agreement could signal a new era for the CNSA which has enjoyed little in the way of cooperation with other federal space agencies in the past. Due to the agency's strong military connections, the US government passed legislation in 2011 that barred the CNSA from participating in the agreement between ESA and China could open the way for a three-party collaboration involving NASA.

As has been said countless times since the end of the Apollo Era, "we're going back to the Moon and this time we intend to stay."

WORLD'S FASTEST BEING

AreebaUsmani B.Sc. (H) Zoology, II Year

The creature isn't a cheetah or a falcon; instead, it's a single-celled organism called *Spirostomum ambiguum*, commonly found in bodies of water. Cheetahs can sprint at speeds of more than 60 mph (96.5 km/h), and falcons may dive at well over 250 mph (400 km/h). But *S. ambiguum* can move even faster, shortening its body by 60 percent into a football shape within "a few milliseconds," according to a press release. But researchers have no idea how the single-celled organism can move this fast without the muscle cells of larger creatures. And scientists have no clue how, regardless of how the contraction works, the little critter moves like this without wrecking all of its internal structures.



<https://www.livescience.com/63303-fastest-creature-single-cell-nanobot.html>,

Photograph; *Spirostomum ambiguum* specimens, each about 4 millimeters long in its expanded state, look wormlike under a microscope. (Credit: Rob Felt, Georgia Tech.)

Saad Bhamla, a researcher at Georgia Tech, received a grant from the National Science

Foundation to study and model *S. ambiguum*'s contraction motion at the subcellular level. He hopes to come to understand the motion well enough, he said, to break it down into ideas that could be used for robots. "As engineers, we like to look at how nature has handled important challenges," Bhamla said in the release. "We are always thinking about how to make these tiny things that we see zipping around in nature. If we can understand how they work, maybe the information can cross over to fill the gap for small robots that can move fast with little energy use." When you curl into a ball like the *S. ambiguum*, or sprint like a cheetah, or dive like a falcon, you activate actin and myosin proteins in your muscle cells that contract to generate motion, the statement said.

But tiny creatures like *S. ambiguum* don't rely on proteins of that sort, Bhamla said. (*S. ambiguum* exists on a sort of fuzzy boundary between animals and non-animals. Older texts often considered single-celled "protozoans"). "If they had only the actin and myosin proteins that make up our muscles, they couldn't generate enough force to actually move that fast," Bhamla added. "The smaller they are, the faster they accelerate — up to 200 meters per second square. That's really off the charts." Instead, the creatures use alternative, complex molecules to achieve both motion and tasks like moving their internal structures around.

THE SOUND OF RAIN

Divya, B.Sc. (H) Botany, II Year

*The clouds gurgled I the sky
With a wryful face and lofty eyes,
Casting darkness upon the world
Until they curled up otherwise.*

*The world was filled by thunder
That cast asunder nature's breath,
Bringing forth upon golden meadows
The great black shadows of death.*

*The wind thereby began to blow
And flow into the meadows green
Such a storm blew through the land
That sand in the wind was seen.*

*The black skies began to cry
And their wry thereby gone
The birds danced and wind bells rang
The song birds sang their graceful Song.*

*The sound of rain took over the world
It's sounds swirled through the high hall
Healing all the world – wound sore
And life took over within the walls.*

*The tears of cloud thrived around
Its sound was clear and enchanting
Riding the world of weariness
And darkness I shadows haunting.*

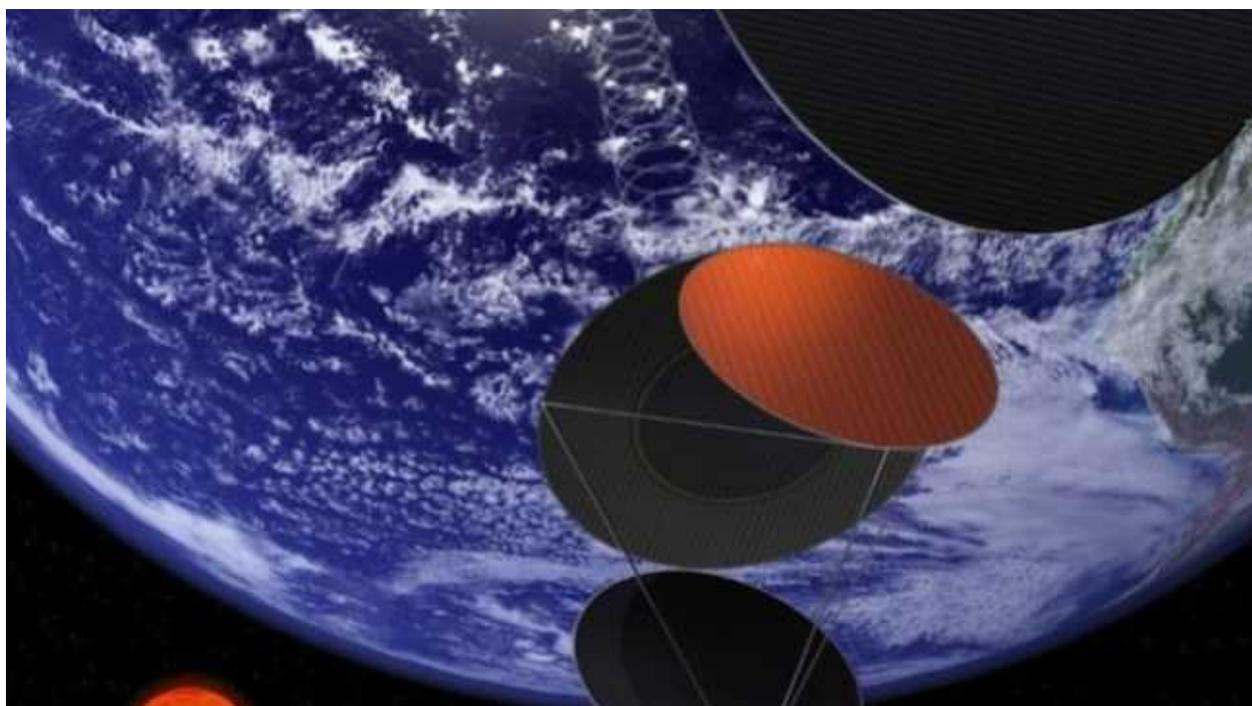
*The death of light had never been merrier
Than when the barriers began to weep
And all gloom whichever hovered
Was covered in rainwater pools deep.*

*After the end of heavy showers
Began to bloom flowers fair,
And the light of day shone bright
Above the white trees bare.*

*But that is not the end of the rain
For the sky may feign to light attain
But that is not the end of the rain
For the rain shall begin again.*

SPACE BASED SOLAR FARM

BhavnaKathuria, B.Sc. (H) Chemistry, III YEAR



The farming in earth was the first successful practice done by human for the survival! But it is more surprisingly to say that this practice can even now done in space too. Scientists are putting All their efforts to make possible this practice in space where there is no sign of life. The most challenging thing they are facing is that to maintain that climatic conditions which require in this farming practice.

Well, thanks to JAXA, the Japan Aerospace Exploration Agency, we could actually witness this incredible technology in just over a decade.....

The idea of a space power plant has actually been around for a while. Back in 1968, American aerospace engineer Dr. Peter Glaser the space solar power concept and proposed the invention of giant solar panels in space in order to generate microwaves that could be transmitted back to Earth to produce electricity. The concept sparked a lot of interest, even from NASA, but it came to a halt in the '80s because of the high costs involved.

Japan, however, pursued the idea and is currently the world leader of the Space Solar Power Systems (SSPS) project....

What`s next?

JAXA is planning to conduct tests by the end of this year demonstrating its retro directive beam control system. In 2018 it hopes to perform the first microwave power transmission in space, channeling several kilowatts from low Earth orbit to the ground while ensuring that the microwave beam doesn't interfere with existing communications infrastructure. Following these initial steps, JAXA is aiming to commence a 100 kW SPS demonstration in 2020, whereby engineers could verify the technologies required to scale up the system. From here, it claims an international consortium involving experts from around the globe would be required to construct a 1 GW commercial SPS throughout the 2030s.....

With a finite supply of fossil fuels and increasing pressure to shift to clean, renewable energy, a

constant stream of power drawn from an unlimited source could have environmental and economic impacts across the globe. While it's a concept that seems out of this world in more ways than one, and a 1 GW solar farm would hardly register a blip on Japan's energy consumption radar, demonstrating progress toward a functioning SPS could constitute an effective proof-of-concept and garner further private and public sector interest in space-based solar.

And now for the really tricky part: getting all of that solar energy back to Earth so that we can use it. There are two possible ways that this could be achieved which involve converting the solar energy into either laser beams or microwaves, or perhaps even a combination of both, which would then be transmitted to a receiving facility (called a "rectenna" [rectifying antenna]) situated on Earth.

These space based solar panels would be around 5-10 times more efficient than ground-based solar conversion systems. Furthermore, CO2 emissions will be low and will only come from the receiving facility. It's predicted that SSPS will be able to process around 1 gig watt of power, which is a similar amount to nuclear power stations.

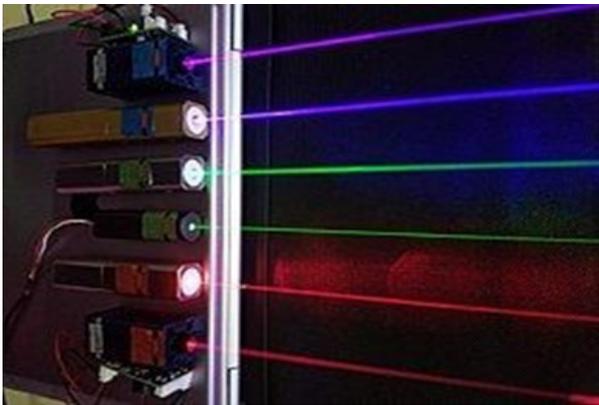
Although Japan are the leading country with regards to making SSPS happen, in reality the costs will be so astronomical that it is likely contributions from other countries will be required before we see this behemoth space power station start to take shape. This concept may seem a little far-fetched, but JAXA believe they are getting close to turning this vision into a reality.

SPECTRUM

LASER

Harsh Chauhan, B.Sc. Physical Science, II Year

The word laser stands for '**Light Amplification Through Stimulated Emission of Radiation**'. In simple words, a device that emits out light at particular wavelength and amplifies that light, typically producing a very narrow beam of Radiation. The first laser was built in 1960 by **Theodore H. Maiman** at Hughes Research Laboratories, based on theoretical work by **Charles Hard Townes** and **Aurthur Leonard Schawlow**.



<https://en.m.wikipedia.org/wiki/File:Lasers.JPG>

However, Laser is actually a generator of light and should have been named as LOSER which stands for Light Oscillating through Stimulated Emission of Radiation. This name was avoided because of bad connotation and the name Laser has been preferred.

A laser is an unusual light source. It is quite different from a light bulb or a flash light. Lasers produce a very narrow beam of light. This type of light is useful for lots of technologies and instruments—even some that you might use at home!

HOW DOES LASER DIFFER FROM ORDINARY LIGHT?

Light travels in waves, and the distance between the peaks of a wave is called the **wavelength**. Each color of light has a different wavelength. For example, blue light has a shorter wavelength than red light. Sunlight and the typical light from a

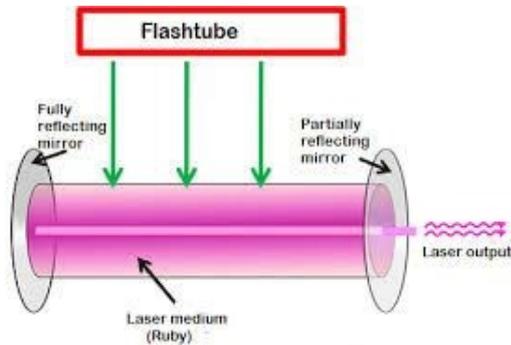
light bulb is made up of light with many different wavelengths.

Our eyes see this mixture of wavelengths as white light. Each color of light has a different wavelength. For example, blue light has a shorter wavelength than red light. Sunlight and the typical light from a light bulb is made up of light with many different wavelengths. Our eyes see this mixture of wavelengths as white light. A laser is different. Lasers do not occur in nature. However, we have figured ways to artificially create this special type of light. The light emitted from a laser is monochromatic, that is, it is of one wavelength (color). Lasers produce a narrow beam of light in which all of the light waves have very similar wavelengths. The laser's light waves travel together with their peaks all lined up, or in phase. This is why laser beams are very narrow, very bright, and can be focused into a very tiny spot because laser light stays focused and does not spread out much (like a flashlight would), laser beams can travel very long distances. They can also concentrate a lot of energy on a very small area.

TYPES OF LASER

Lasers are mainly classified into 4 types based on the type of laser medium used:-

1. Solid-state laser: A solid-state laser is a laser that uses solid as a laser medium. In these lasers, glass or crystalline materials are used. Ions are introduced as impurities into host material which can be a glass or crystalline. The process of adding impurities to the substance is called doping. The first solid-state laser was a ruby laser.



<https://goo.gl/images/cVCPQr>

It is still used in some applications. In this laser, a ruby crystal is used as a laser medium.

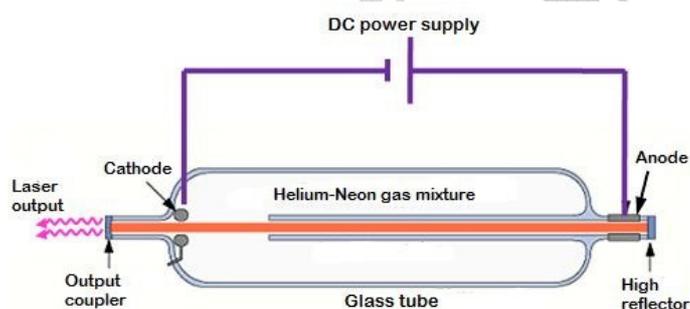
Ex: ruby lasers, Nd:YAG lasers, colour center lasers

Uses..

I. It is used in holography

II. It is used in measuring electron density and temp. of plasma.

2. Gas laser: A gas laser is a laser in which an electric current is discharged through a gas inside the laser medium to produce laser light. In gas lasers, the laser medium is in the gaseous state.

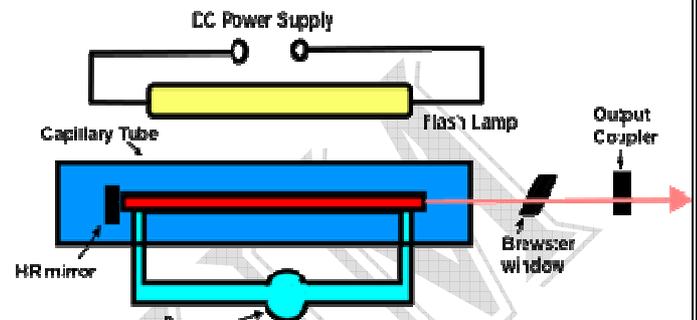


<https://goo.gl/images/UJjFWK>

Gas lasers are used in applications that require laser light with very high beam quality and long coherence lengths. Gas lasers are of different types: they are, Helium (He) – Neon (Ne) lasers, argon ion lasers, carbon dioxide lasers (CO₂ lasers), carbon monoxide lasers (CO lasers) etc.

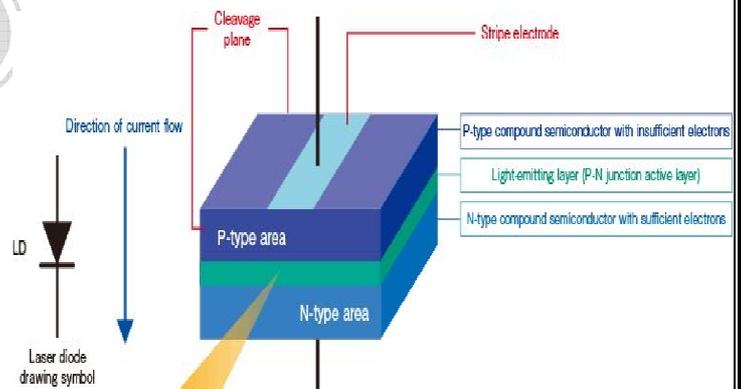
3. Liquid laser: A liquid laser is a laser that uses the liquid as laser medium. In liquid lasers, light supplies energy to the laser medium. A dye laser is an example of the liquid laser. A dye laser

is a laser that uses an organic dye (liquid solution) as the laser medium. These lasers generate laser light from the excited energy states of organic dyes dissolved in liquid solvents. It produces laser light beam in the near ultraviolet (UV) to the near infrared (IR) region of the spectrum.



<https://www.daenotes.com/electronics/microwave-radar/dye-laser>

4. Semiconductor laser: Semiconductor lasers are also known as laser diodes. Laser diode is similar to LED. These lasers are very cheap, compact size and consume low power. In semiconductor lasers, a p-n junction of a semiconductor diode forms the active medium or laser medium. The optical gain is produced within the semiconductor material. Ex: Ga-As, Gap.



https://www.sony-semicon.co.jp/products_en/laserdiode/wld/technology/guide.html

USES IN DAILY LIFE

1. Medical applications: We really do live in an age of modern marvels, as new technologies are helping shape the world around us. One of the biggest impacts that lasers have had in the real world can be found in the medical sector, as they have been used for a number of

purposes, including treating cancers, diagnosing diseases and making highly precise incisions.

2. Welding and cutting: One of the most common uses of laser cut technology can be found in welding and cutting, as they offer many advantages when compared to mechanical approaches. They allow for the fabrication of intricate structures without compromising on quality, while their highly precise and timely function makes for fast turnaround times – an essential aspect of the industry.

3. Textiles: Laser cutting technology is transforming the world one sector at a time, with the textile industry being the next big thing to take precedence. Lasers have been used to create clothing, jewelry and other such items in recent times, with major fashion brands adopting the technique. There are several reasons as to why this may be, including the extreme accuracy and the quick production rate which has helped designers reduce the overall time working on a product.

4. Heat Treatment: Heat treatment for hardening or reinforcing materials isn't exactly new, but lasers have opened up a world of new possibilities. For example, lasers can provide localized heat treatments to highly detailed machinery such as automobile camshafts – preserving the precision of the build.

5. Barcode scanners: Introducing lasers to the retail industry was a masterstroke, with barcode scanners optimizing it like never before. The reason being is that they scan products and store the information on them, meaning that they can help count stock levels as well as track customer habits – an essential aspect of retail

LASER AND NOBLE PRIZE



Arthur Ashkin, Gérard Mourou and Donna Strickland
<https://goo.gl/images/V895YW>

The Nobel Prize in Physics 2018 was awarded for ground breaking inventions in the field of laser physics with one half to **Arthur Ashkin** for the optical tweezers and their application to biological systems and the other half jointly to **Gerard Mourou** and **Donna Strickland** for their method of generating high-intensity, ultra-short optical pulses.

Their inventions have revolutionized laser physics. Extremely small objects and incredibly rapid processes are now being seen in a new light. Advanced precision instruments are opening up unexplored areas of research and a multitude of industrial and medical applications.

LASER IN FUTURE LASER was a technological breakthrough. These are some ways that lasers can be used in the future...

1) Dream of unlimited energy An even more ambitious and far-reaching future use for the laser will be the production of energy, mainly in the form of electricity to power homes, factories, offices, and machines.

2) Computing at light speed If we can leverage the speed of light in optical computers, and somehow be able to make every part of a computer using optical logic units, then we can have a computer that runs on light. With some intelligent light filters, it can run directly using sun's light (not its energy, but the light itself) that will save millions of cost, and megawatts of energy and will be a greener solution.

3) In 3D scanning Lasers will be used in making a 3D map of the surrounding world. By projecting a single beam of laser many times and capturing the returned intensity and location of laser, we can map the surroundings, and by using IR/visible/UV maps, we can know far more than a 2D image. Indeed, the laser may one day harness the fire of the stars to give humanity clean, safe, and abundant energy for generations to come as well as access to alien knowledge that could transform the world in ways not yet imagined...

ASTONISHING SCIENTIFIC FACTS

SakshiYadav, B.Sc. (H) Zoology, II Year



(Image; representational purpose only, <https://steemit.com/science/@sreevin/some-amazing-science-facts-part-1>)

- Hot water freezes faster than cold water, this fact seems counter intuitive but its' called Mpemba effect.
 - Helium can also work against gravity: when helium is cooled to extreme temperatures, just a few degrees away from absolute zero(-460 degree Fahrenheit or -273 degree Celsius);it turns into a superfluid, meaning it can flow without friction. It can climb up and over the sides of a glass.
 - It's impossible to burp in space: when you burp on earth, gravity keeps down the solids and liquids from the food, do only the escapes from our mouth. In the absence of gravity, the gas cannot separate from the liquids and solids ,so burping essentially turns into puking.
 - Grasshoppers have ears in their bellies: Like humans, they do not have ears on the side of their head. Their sound detector is a thin membrane called a tympanum or eardrum covered by wings.
 - Only one letter doesn't appear in the periodic table, it's the J go ahead and double check.
 - A new state of matter exist and it is known as Time Crystal: created in the lab, the outrageously hard-to-grasp time crystals are structures that repeat periodically in time rather than space, potentially defying the laws of physics.
 - Humans accidentally created a protective bubble around earth: Decades of use of very low frequency radio communications have resulted in an artificial cocoon that could help protect the planet from solar flares and radiation particles.
- Its time to take a look at how amazing and freaky we all are-
- Laid end to end, adult's blood vessels could circle Earth's equator four times.
 - Humans can't taste food without saliva. Chemoreceptors in the taste buds of our tongue require a liquid medium for the flavors to bind into the receptor molecule.
 - It is possible to die from drinking too much water. Water intoxication and hyponatremia result when a dehydrated person drinks too much water without the accompanying electrolytes.
 - The average person has 67 different species of bacteria in their belly button.
 - The cornea is the only part of the body with no blood supply-it gets its oxygen from air.
 - When we blush the inside of our stomach does too.
 - Humans are bioluminescent, the light just is not perceptible to the human eye.
 - 50 percent of our hand strength comes from our pinky finger.
 - The word 'muscle' comes from Latin term meaning 'Little mouse' which is what ancient Romans thought flexed bicep muscles resembled to.

UNIVERSE: - A MYSTERY

MukharBhardwaj and Mohd.Sharique B.Sc. Physical Science, I Year

Universe, the whole cosmic system of matter and energy of which Earth, and therefore the human race, is a part. Humanity has travelled a long road since societies imagined Earth, the Sun, and the Moon as the main objects of creation, with the rest of the universe being formed almost as an afterthought. Today it is known that Earth is only a small ball of rock in a space of unimaginable vastness and that the birth of the solar system was probably only one event among many that occurred against the backdrop of an already mature universe. This humbling lesson has unveiled a remarkable fact, one that endows the minute particle in the universe with a rich and noble heritage: events that occurred in the first few minutes of the creation of the universe 13.7 billion years ago turn out to have had a profound influence on the birth, life, and death of galaxies, stars, and planets. Indeed, a line can be drawn from the forging of the matter of the universe in a primal "big bang" to the gathering on Earth of atoms versatile enough to serve as the basis of life. The intrinsic harmony of such a worldview has great philosophical and aesthetic appeal, and it may explain why public interest in the universe has always endured. So here are some interesting phenomena related to it.

Big Bang Theory - The Big Bang Theory is the leading explanation about how the universe began. At its simplest, it says the universe as we know it started with a small singularity, then inflated over the next 13.8 billion years to the cosmos that we know today. While the majority of the astronomical community accepts the theory, there are some theorists who have alternative explanations besides the big bang — such as eternal inflation or an oscillating universe.

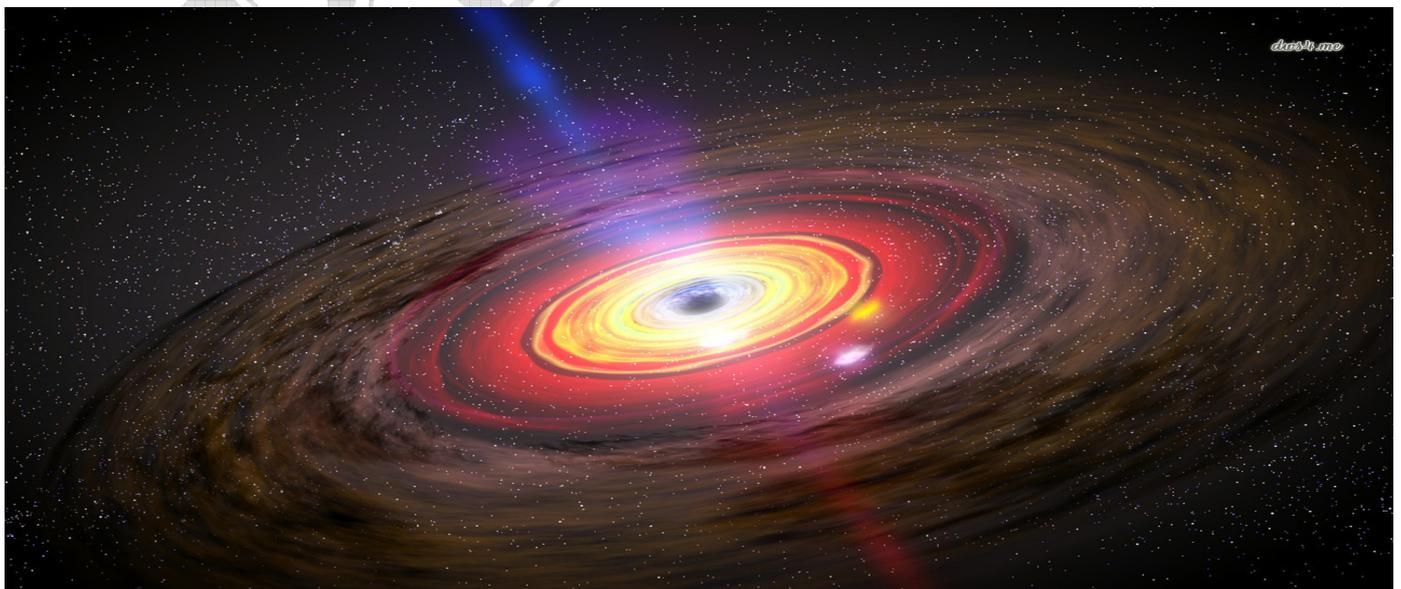
Physicists are undecided whether this means the universe began from a singularity, or that current knowledge is insufficient to describe the universe at that time. Detailed measurements of the expansion rate of the universe place the Big Bang at around 13.8 billion years ago, which is thus considered the age of the universe. After its initial expansion, the universe cooled sufficiently to allow the formation of subatomic particles, and later simple atoms. Giant clouds of these primordial elements (mostly hydrogen, with some Helium and lithium) later coalesced through gravity, eventually forming early Stars and galaxies, the descendants of which are visible today. Astronomers also observe the gravitational effects of dark matter surrounding galaxies.



Though most of the mass in the universe seems to be in the form of dark matter, Big Bang theory and various observations seem to indicate that it is not made out of conventional baryonic matter (protons, neutrons, and electrons) but it is unclear exactly what it is made out of. The scientific community was once divided between supporters of two different theories, the Big Bang and the Steady State Theory, but a wide range of empirical evidence has strongly favored the Big Bang which is now universally accepted. In 1929, from analysis of galactic red shifts, Edwin Hubble concluded that galaxies are drifting apart; this is important observational evidence consistent with the hypothesis of an expanding universe. In 1964, the cosmic microwave background radiation was discovered, which was crucial evidence in favor of the Big Bang model. Since that theory predicted the existence of background radiation throughout the universe before it was discovered. More recently, measurements of the redshifts of supernovae indicate that the expansion of the universe is accelerating an observation attributed to dark energy's existence. The known physical laws of nature can be used to calculate the characteristics of the universe in detail back in time to an initial state of extreme density and temperature.

Black hole - A cosmic body of extremely intense gravity from which nothing, not even light, can

escape. A black hole can be formed by the death of a massive star. When such a star has exhausted the internal thermonuclear fuels in its core at the end of its life, the core becomes unstable and gravitationally collapses inward upon itself, and the star's outer layers are blown away. The crushing weight of constituent matter falling in from all sides compresses the dying star to a point of zero volume and infinite density called the singularity. Moreover, Quantum Field Theory in curved space-time predicts that event horizons emit Hawking radiation, with the same spectrum as a black body of a temperature inversely proportional to its mass. This temperature is on the order of billionths of a kelvin for black holes of stellar mass, making it essentially impossible to observe. Black holes of stellar mass are expected to form when very massive stars collapse at the end of their life cycle. After a black hole has formed, it can continue to grow by absorbing mass from its surroundings. By absorbing other stars and merging with other black holes, supermassive black holes of millions of solar masses may form. There is general consensus that supermassive black holes exist in the centers of most galaxies. Despite its invisible interior, the presence of a black hole can be inferred through its interaction with other matter and with electromagnetic radiation such as visible light.



Matter that falls onto a black hole can form an external accretion disk heated by friction, forming some of the brightest objects in Universe. If there are other stars orbiting a black hole, their orbits can be used to determine the black hole's mass and location. Such observations can be used to exclude possible alternatives such as neutron stars. In this way, astronomers have identified numerous stellar black hole candidates in binary systems, and established that the radio source known as Sagittarius A*, at the core of the Milky Way galaxy, contains a supermassive black hole of about 4.3 million solar masses. No matter their starting size, black holes can grow throughout their lives, slurping gas and dust from any objects that creep too close. Anything that passes the event horizon, the point at which escape becomes impossible, is in theory destined for spaghettification thanks to a sharp increase in the strength of gravity as you fall into the black hole. But black holes aren't exactly "cosmic vacuum cleaners," as often depicted in popular media. Objects must creep fairly close to one to lose this gravitational tug-of-war. For example, if our sun was suddenly replaced by a black hole of similar mass, our planetary family would continue to orbit unperturbed, if much less warm and illuminated.

White Holes - White holes, which are theoretically the exact opposites of black holes,

could constitute a major portion of the mysterious dark matter that's thought to make up most of the matter in the universe, a new study finds. And some of these bizarre white holes may even predate the Big Bang, the researchers said. Black holes possess gravitational pulls so powerful that not even light, the fastest thing in the universe, can escape them. The invisible spherical boundary surrounding the core of a black hole that marks its point of no return is known as its event horizon. A black hole is one prediction of Einstein's theory of general relativity. Another is known as a white hole, which is like a black hole in reverse: Whereas nothing can escape from a black hole's event horizon, nothing can enter a white hole's event horizon. Previous research has suggested that black holes and white holes are connected, with matter and energy falling into a black hole potentially emerging from a white hole either somewhere else in the cosmos or in another universe entirely. In 2014, Carlo Rovelli, a theoretical physicist at Aix-Marseille University in France, and his colleagues suggested that black holes and white holes might be connected in another way: When black holes die, they could become white holes. In the 1970s, theoretical physicist Stephen Hawking calculated that all black holes should evaporate mass by emitting radiation. Black holes that lose more mass than they gain are expected to shrink and ultimately vanish.



However, Rovelli and his colleagues suggested that shrinking black holes could not disappear if the fabric of space and time were quantum — that is, made of indivisible quantities known as quanta. Space-time is quantum in research that seeks to unite general relativity, which can explain the nature of gravity, with quantum mechanics, which can describe the behavior of all the known particles, into a single theory that can explain all the forces of the universe. In the 2014 study, Rovelli and his team suggested that, once a black hole evaporated to a degree where it could not shrink any further because space-time could not be squeezed into anything smaller, the dying black hole would then rebound to form a white hole. There is no hard evidence proving that white holes exist, but maybe in our vast complicated universe, there's space even for them.

Worm Holes - A wormhole is a theoretical passage through space-time that could create shortcuts for long journeys across the universe. Wormholes are predicted by the theory of general relativity. But be wary: wormholes bring with them the dangers of sudden collapse, high radiation and dangerous contact with exotic matter. Wormholes are consistent with the general theory of relativity, but whether wormholes actually exist remains to be seen. A wormhole could connect extremely long distances such as a

billion light years or more, short distances such as a few meters, different universes, or different points in time. For a simplified notion of a wormhole, space can be visualized as a two-dimensional (2D) surface. In this case, a wormhole would appear as a hole in that surface, lead into a 3D tube (the inside surface of a cylinder), then re-emerge at another location on the 2D surface with a hole similar to the entrance. An actual wormhole would be analogous to this, but with the spatial dimensions raised by one. For example, instead of circular holes on a 2D plane, the entry and exit points could be visualized as spheres in 3D space. Another way to imagine wormholes is to take a sheet of paper and draw two somewhat distant points on one side of the paper. The sheet of paper represents a plane in the space-time continuum, and the two points represent a distance to be travelled, however theoretically a wormhole could connect these two points by folding that plane so the points are touching. In this way it would be much easier to traverse the distance since the two points are now touching. Today's technology is insufficient to enlarge or stabilize Black holes, whiteholes and wormholes, even if they could be found. However, scientists continue to explore the concept as a method of space travel with the hope that technology will eventually be able to utilize them.



STEPHEN WILLIAM HAWKINS, THE MAN ON COMPUTERIZED CHAIR

Somjeet Jaiswal & Sultan Ahmed, B.Sc. (H) Zoology, II Year

``However difficult life may seem, there is always something you can do and succeed at``

Stephen Hawking (1942-2018)



<https://www.cambridge-news.co.uk/news/gallery/stephen-hawking-life-pictures-12374730>

Professor Stephen William Hawking was born on 8th January 1942 (exactly 300 years after the death of Galileo) in Oxford, England. His parents' house was in north London but during the second world war Oxford was considered a safer place to have babies. When he was eight his family moved to St. Albans, a town about 20 miles north of London. At the age of eleven, Stephen went to St. Albans School and then on to University College, Oxford (1952); his father's old college. Stephen wanted to study mathematics although his father would have preferred medicine. Mathematics was not available at University College, so he pursued physics instead. After three years and not very much work, he was awarded a first class degree in natural science.

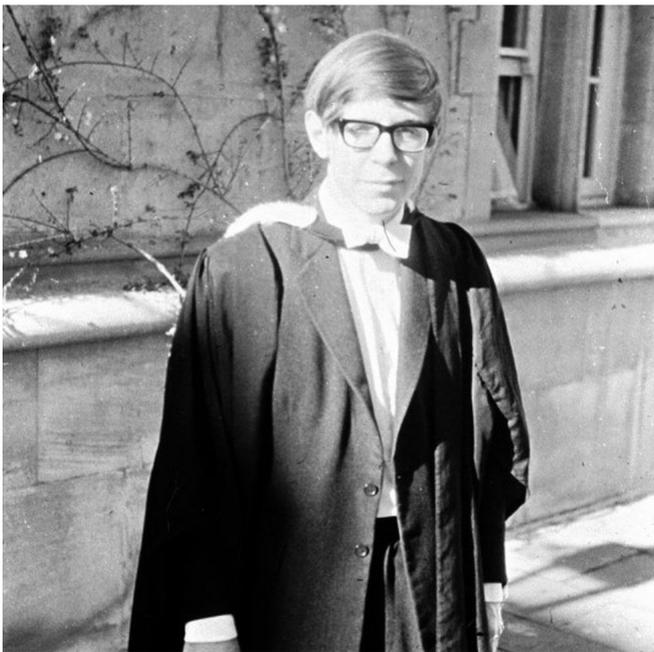
Stephen Hawking, who passed away at the age of 76 last week, was a world-renowned physicist. He will forever live inside our history books, synonymous with theories that helped us understand the universe's beginnings and how black holes behave.

The disability that made him on Chair...

But Hawking is not only noteworthy for his prolific physics work: For over 50 years he lived with amyotrophic lateral sclerosis, or ALS. The disease (which in the U.K. is called motor neuron disease, and in the U.S. commonly referred to as Lou Gehrig's disease) typically runs its fatal course more swiftly. The condition makes its mark on the body by affecting the neurons that control muscles. But Stephen Hawking lived for 55 years following his diagnosis. What made him such an outlier??? Most people with ALS eventually succumb to respiratory failure or dehydration and malnutrition—often a result of weakening and deterioration of those particular muscle groups. Hawking was fortunate enough to have access to this medical support, which helped him survive. Hawking was also diagnosed with the disease when he was just 21 years old, which is a good 20 or 30 years younger than is most typical. Researchers have found that people diagnosed in their teen years often live for decades. The fact that Hawking's mind remained sharp is another point of note, though a little less straightforward. Some people with ALS experience dementia, or at least have such difficulty interacting with the world around them as to limit their intellectual engagement. But thanks to a computer that

allowed him to write a few words a minute using the movement of his cheek muscles.

Hawking authored books and papers and gave countless lectures until shortly before his death. Whether or not this cognitive ability contributed to his longevity is unclear. Stephen Hawking never knew how much longer he would have to live. He publicly noted on several occasions that this uncertainty gave him an added incentive and hurry to continue his life's work.



<https://usefulstooges.com/2018/03/27/stephen-hawking-a-brilliant-scientist-a-flawed-man/>

Perhaps one way to view Hawking's life is as such: You never know how lucky or unlucky you will get. Hawking never knew how much time he had—but then again, none of us do. He will be remembered not just as a massively influential astrophysicist, but as a reminder to make the best of the time you've got. And for anyone grappling with a diagnosis of ALS or another potentially terminal illness, he will always offer hope of a long life, richly lived.

"I have lived with the prospect of an early death for the last 49 years. I'm not afraid of death, but I'm in no hurry to die. I have so much I want to do first," he told The Guardian in 2011.

His special chair....

Professor and wheelchair user Stephen Hawking is known for two things. The first is that he is the most brilliant physicist since Einstein, and he's crafted a set of basic laws that govern everything we know about the universe. He holds more awards and medals than can be counted, with twelve honorary degrees in addition to his earned degrees. The second thing for which Hawking is known is his disability. Hawking's chair uses the type of predictive text technology to which we have become accustomed with our smart phones, but he's had it since 1997, and it's leaps and bounds ahead of what we all use on a daily basis. Hawking can move a cursor across a screen and stop it to type by a minuscule movement of his cheek which is detected by infrared sensors in his glasses. Once he has typed two letters in this manner, the predictive text kicks in and allows him to select full words. When he completes a sentence, he sends the text to a speech synthesizer which can imitate American, Scandinavian, or Scottish accents. In addition, the same technology allows him to use a mouse to operate an entire computer mounted to his wheelchair. He can talk with people, read, write, email, and Skype in this manner.

Hawking updates and upgrades his equipment regularly, as you might expect. In fact, Intel has a dedicated team of computer engineers always working to improve the facial recognition technology that Hawking relies upon to express his thoughts and do his work. The chair, like the man, is ingenious and only seems to get better with each passing year. Professor Hawking may be confined to a wheelchair, but he certainly doesn't let that confine his ability to understand the cosmos and share his knowledge with the world.

Achievements and Contribution....

October 1962, Stephen arrived at the Department of Applied Mathematics and Theoretical Physics (DAMTP) at the University of Cambridge to do research in cosmology, there being no-one

working in that area in Oxford at the time. After gaining his PhD (1965) with his thesis titled 'Properties of Expanding Universes', he became, first, a research fellow (1965) then Fellow for Distinction in Science (1969) at Gonville & Caius college. In 1966 he won the Adams Prize for his essay 'Singularities and the Geometry of Space-time'. Stephen moved to the Institute of Astronomy (1968), later moving back to DAMTP (1973), employed as a research assistant, and published his first academic book, *The Large Scale Structure of Space-Time*, with George Ellis.



The physicist at Cambridge University in 1988

<https://www.independent.co.uk/news/health/stephen-hawking-death-how-live-als-motor-neurone-disease-long-treatment-a8255241.html>

During the next few years, Stephen was elected a Fellow of the Royal Society (1974) and Sherman Fairchild Distinguished Scholar at the California Institute of Technology (1974). He became a Reader in Gravitational Physics at DAMTP (1975), progressing to Professor of Gravitational Physics (1977). He then held the position of Lucasian Professor of Mathematics (1979-2009). The chair was founded in 1663 with money left in the will of the Reverend Henry Lucas who had been the Member of Parliament for the University. It was first held by Isaac Barrow and then in 1669 by Isaac Newton. From 2009, Stephen was employed as the Dennis Stanton Avery and Sally Tsui Wong-Avery Director of Research at DAMTP. Professor Stephen Hawking worked on the basic laws which govern the universe. With

Roger Penrose he showed that Einstein's general theory of relativity implied space and time would have a beginning in the Big Bang and an end in black holes (1970). These results indicated that it was necessary to unify general relativity with quantum theory, the other great scientific development of the first half of the 20th century. One consequence of such a unification that he discovered was that black holes should not be completely black, but rather should emit 'Hawking' radiation and eventually evaporate and disappear (1974). Another conjecture is that the universe has no edge or boundary in imaginary time. This would imply that the way the universe began was completely determined by the laws of science.

His many publications included *The Large Scale Structure of Spacetime* with G F R Ellis, *General Relativity: An Einstein Centenary Survey*, with W Israel, and *300 Years of Gravitation*, with W Israel.

Professor Stephen Hawking received thirteen honorary degrees. He was awarded CBE (1982), Companion of Honor (1989), the Presidential Medal of Freedom (2009), the Fundamental Physics prize (2013), Copley Medal (2006) and the Wolf Foundation prize (1988). He was a Fellow of the Royal Society and a member of the US National Academy of Sciences and the Pontifical Academy of Sciences. Thanks to the Zero-G Corporation, he experienced weightlessness in 2007 and always hoped to make it into space one day.

Stephen Hawking: Books

Over the years, Stephen Hawking wrote or co-wrote a total of 15 books. A few of the most noteworthy include:

'A Brief History of Time' In 1988 Hawking catapulted to international prominence with the publication of *A Brief History of Time*.

'The Universe in a Nutshell' *A Brief History of Time* also wasn't as easy to understand as some had hoped. So in 2001, Hawking followed up his

book with *The Universe in a Nutshell*, which offered a more illustrated guide to cosmology's big theories.



With President Obama 2012

<https://usefulstooges.com/2018/03/27/stephen-hawking-a-brilliant-scientist-a-flawed-man/>

'*The Grand Design*' In September 2010, Hawking spoke against the idea that God could have created the universe in his book *The Grand Design*.

Black Holes and Baby Universes and Other Essays, *The Universe in a Nutshell*, and *My Brief History*.

Towards the end of his life, Stephen was working with colleagues on a possible resolution to the black hole information paradox, where debate centers around the conservation of information. On March 14, 2018, Hawking finally succumbed to ALS, the disease that was supposed to have killed him more than 50 years earlier. A family spokesman confirmed that the iconic scientist died at his home in Cambridge, England.

(Sources; <http://www.hawking.org.uk/about-stephen.html>

<https://www.popsoci.com/stephen-hawking-als-motor-neuron-disease>

<https://www.amsvans.com/blog/stephen-hawking-wheelchair-in-detail/>

<https://www.biography.com/people/stephen-hawking-9331710>)

A RECAPITULATION ON UNWHOLESOME AND AILING OCEAN

Sakina Asghar B.Sc. (H) Botany, II Year

The reason behind the ailing sea is, of course, is human intervention. It has become the end-all and be-all of our existence which in turn has led to the creation of Dead zones.

Dead zone refers to the severe oxygen scantiness and shortage that lead to either hypoxia or anoxia condition where oxygen is low and another where oxygen is absent. It occurs due to multiple reasons and the most wide-ranging & malignant one is Eutrophication which in its later phase leads to algal bloom and rapid microbial growth due to which uptake of oxygen increases and dissolved oxygen levels decrease. It occurs mainly due to the human contribution in pollution, we are responsible for the 'Ailing ocean', the reasons for illness of the ocean is the excessive use of fertilizers containing nitrates, phosphates which help in excessive growth of algae and the rapid growth and their bloom and doom cycle create deposition of organic matter which also releases venomous gas making water hazardous for both human as well as aquatic life.

It is the high time to use the resources available at a sustainable level keeping in view its pros and cons on the environment and natural water bodies should minimize the use of chemical fertilizers which will decrease the number of dead zones. The hypoxia and anoxia are among the most widespread noxious anthropogenic influences on marine, benthic organisms and hydrophytes leading to declining in fisheries, recreational purpose, global environmental problems, algal blooms and so on. It is not possible to return to reach the earlier nutrient level i. e. Preindustrial nutrient level, but the sustainable and appropriate management of fertilizers & industrial effluents would be helpful to reduce nutrient inputs to levels that happened in the mid of 20th century

before eutrophication began to spread dead zones globally.

For instance-*ARABIAN SEA AND DEAD ZONE*

The Arabian sea covers the northern region of the Indian ocean. The Arabian sea covers area about 3,862,000 km² and is about 4,652 deep. The countries surrounding the Arabian sea coastline are Somalia, Oman, Yemen, Pakistan, India, Maldives and two major branches that pour into the Arabian sea are the Gulf of Oman and Gulf of Aden. The largest river that flows into the Arabian sea Indus river. Indus river flow from Tibetan plateau from lake Mansarovar runs to Ladak and region of Jammu and Kashmir towards Gilgit Baltistan and Hindukush and then flow south to the entire length of Pakistan to merge into the Arabian sea. (Chisholm, Hugh, ed. 1911). Arabian is reported to be one of the largest Dead zone found. The first oxygen depletion was observed in complete monsoon cycle of 1995. Application of the dissolved oxygen, nitrate, and nitrites concentration and density values to delineate the oxygen minimum zone in the Arabian sea. In past decades the dead zone has rapidly grown over the Arabian sea, The dead zone found in Arabian sea is one of the largest dead zone presents. (J.M. Morrison et al 1999). the oxygen concentration values are reaching to <0.05 mL (Van Bennekom and Heihle, 1994) The dead zone found in the area is at its peak at the area of Gulf of Oman it is completely depleted of oxygen and no marine life are supported in that area. The Arabian sea has a high rate of eutrophication, it is a region which is rich in nutrient content and enhances the deposition of organic matter which in turn promotes microbial growth and high demand for oxygen. Due to the high demand for oxygen, the dissolved oxygen level starts depleting leading to the mass mortality

of benthic organism further building up nutrients and organic matter in the sediments.

Depending on the bloom and burst cycle of organisms and animal population the hypoxia becomes seasonal or periodic. Continuous accumulation of Organic matter and nutrients in the sediments that lead to an expansion of hypoxic zones as the concentration of dissolved oxygen falls and anoxia is established. The microbial breakdown of organic matter and nutrient generates H₂S which is colorless, corrosive, venomous, toxic gas which can be characterized by its rotten egg-like smell. (Robert J. Diaz et al. 2008). The water turns venomous for the aquatic species and many fishes are killed and other aquatic species are also affected. There is no oxygen and aquatic life support such area is called "Anoxic". Many biogeochemical cycles get affected, In region during oxygen depletion condition are established the facultative bacteria switch to use of nitrates ions for oxidation of organic matter (Richards, 1965) nitrate is reduced to molecular nitrogen with nitrate as one of

several intermediates, nitrate is reduced to molecular nitrogen and the end product is free nitrogen the process is denitrification. The prominent respiratory process shift to denitrification is a major component of nitrogen cycle (Mantoura et al. 1993; Naqvi et al., 1992) and when the nitrate is also completely removed from the area, then sulphate ions serve as the next preferred reduction substrate leading to the production of hydrogen sulfide, the true anoxic condition. The dead zone is also caused in this region due to pollution. Many pollutants get added to water streams than to rivers and lake which pour down into the sea. The pollutants include the agricultural waste, pesticide chemicals, industrial waste and human pollution waste of cattle washing, excreting. Air pollution also plays its role when air pollutants are present at the atmosphere and when rain falls these compound pollutants also come down along with the rain droplets causing acid rain then the rainwater accumulates in soils and passed through water streams to rivers lakes and then to seas.

AMAZING FACTS ABOUT CHEMISTRY

Alisha Fatima Rizvi, B.Sc. (H) Chemistry, II YEAR

If you ever liked chemistry in school, or actually have a career working in chemistry, you know chemistry goes beyond beauty. Like physics, there's an inherent romance to chemistry that stems from truth, rather than classic aesthetic features.

Lightning strikes produce Ozone, hence the characteristic smell after lightning storms

Ozone, the triple oxygen molecule that acts like a protective stratospheric blanket against ultraviolet rays, is created in nature by lightning. When it strikes, the lightning cracks oxygen molecules in the atmosphere into radicals which reform into ozone. The smell of ozone is very sharp, often described as similar to that of chlorine. This is

why you get that clean smell sensation after a thunderstorm.

The only two non-silvery metals are gold and copper

A metal is an element that readily forms positive ions (cations) and has metallic bonds. These elements have electrons that are loosely held to the atoms, and will readily transfer them. This is

why metals are great electrical and thermal conductors — because the electrons move energy. Most metals electrons reflect colors equally, so the suns light is reflect as white. Gold and copper, however, happen to absorb blue and violet light, leaving yellow light. Its worth noting here that copper is also the only metal that is naturally antibacterial.

Every hydrogen atom in your body is likely to be 13.5 billion years old, since they were created at the birth of the universe

At ground zero, during the Universes singularity, the very first chemical element was hydrogen. All the other followed by fusing hydrogen into helium, which then fused into carbon and so on. Approximately 73% of the mass of the visible universe is in the form of hydrogen. Helium makes up about 25% of the mass, and everything else represents only 2%. By mass, hydrogen and helium combined make up far less than 1% of the Earth.

Super fluid Helium defies gravity and climbs on walls

A remarkable transition occurs in the properties of liquid helium at the temperature 2.17K (very close to absolute zero), called the lambda point for helium. Part of the liquid becomes a superfluid, a zero viscosity fluid which will move rapidly through any pore in the apparatus.

If you pour a handful of salt into a glass of water, the water level will go downWhen you step inside a bath tub, the water level will immediately go up, per Achimedes law. But when you add a volume of sodium chloride (salt) to a volume of water, the overall volume actually decreases by up to 2%. What gives? The net reduction in observed volume is due to solvent

molecules which become more ordered in the vicinity of dissolved ions.

Diamond and graphite are both entirely made of carbon and nothing elseThough made of the same stuff, the difference between a crown jewel and pencil lead is given by form. Namely, diamond and graphite are arranged differently in space making them allotropes of carbon.

The rarest naturally-occurring element in the Earths crust is astatine

Named after the Greek word for unstable (astatos), Astatine is a naturally occurring semi-metal that results from the decay of uranium and thorium. In its most stable form, the element has a half-time of only 8.1 hours. The entire crust appears to contain about 28 g of the element. If scientists ever have to use it, they basically have to make it from scratch. Only 0.00000005 grams of astatine have been made so far. These buckyballs sell for \$167 million per gram. The only thing more expensive in the world is antimatter.

DNA is a flame retardant

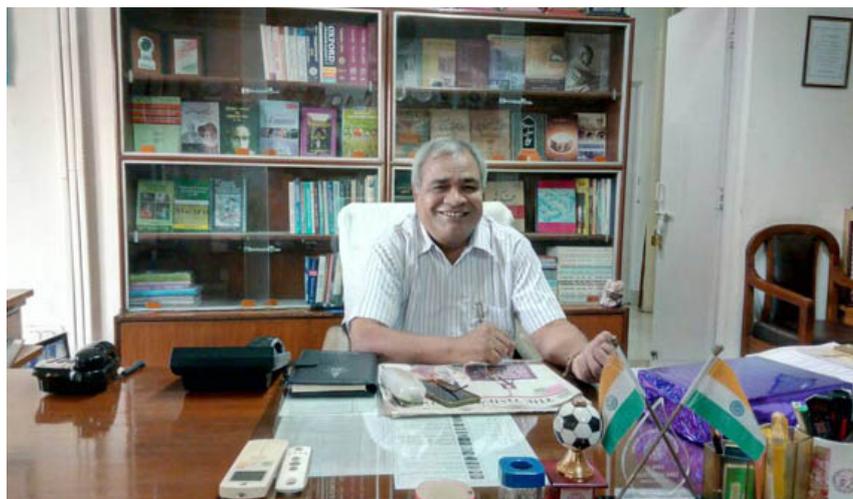
Coating cotton cloth with DNA, researchers found the genetic material reduced the fabrics flammability. When its heated, the phosphate from DNA produces phosphoric acid which replaces the water in cotton fibers as a flame-retarded residue. The bases, which contain nitrogen, react to produce ammonia which inhibits combustion.

One inch of rain is equal to 10 inches of snow

When the temperature is around 30 degrees F, one inch of liquid precipitation would fall as 10 inches of snow — assuming the storm is all snow.

A NOBLE JOURNEY, DR. SUKEKH CHANDRA

Sultan ahmed B.Sc.(Hons.) Zoology



Dr. Sulekh Chandra is an eminent teacher and researcher who served our college for over 3 decades. The brilliant mind completed his B.Sc. degree from Chaudhary Charan Singh University, Meerut in year 1974 followed by M. Sc. in Inorganic Chemistry in the year of 1976 from the same university. He was awarded with Doctorate degree from University of Delhi in the year of 1979.

After receiving his Ph.D, Dr. S Chandra joined as Assistant Professor, department of Chemistry, Zakir Husain Delhi College, University of Delhi in 1980. In preceding years he became a role model not only in department of Chemistry but also to the college by enlightening young minds with his excellence. Dr. Chandra developed a strong research background from his student life which has been reflected throughout his career. He has published over 300 Research Papers in leading scientific journal from various field of chemistry, contributed to many books, Projects, National and International Conferences. Over the decades he has been a face of hope for many students as well as teachers being involved in various committees in co-curricular activities of students. In the year 2017 he was promoted as Principal of our beloved institution. All these achievements, busy schedule and high profession could not let him away from a simple life and closeness to students. The always smiling face finally has to take retire from his marvelous professional life of 38 years on 30 Nov 2018. All the teachers and students are always grateful to him and wish him a much colorful life ahead.

EXPLORING THE NATURE: UTTARAKHAND

Aayushi Kaim & Samaksh Rai B.Sc. (H) Zoology, 1 Year



Like every year, Department of Zoology of Zakir Husain Delhi College organized an excursion cum educational trip. Rajaji National Park, Mussorie and Dehradun, Uttarakhand was destination to be visited.

On 23rd of October, 2018 we met in the college premises around 8pm, and our journey started around 11pm. As it was a long journey so we took two breaks in between. We reached Mussorie early in the morning and had our breakfast. After a long tiring journey, students and teachers had some rest. Around 9am we left from our hotel and went to the famous Kempty Fall. There we enjoyed the drizzle of the fall and the beautiful view of the surrounding. Some students took a refreshing dip in the inviting pool. Apart from the fall, there was an adventure zone too where students did boating and many adventurous activities. After having such an amazing experience, we left the place and reached The Mall Road around 7pm and explored the famed market. After this we came back in hotel at 9pm, took our dinner and then went to our beds.

On second day, we went to Dhanaulti. There we visited Eco Park. It was a trekking place. Trekking and exploring it was a new experience for all of

us. On the top of the hill, we were peacefully relaxing in the nature's lap. After such a perplexing time, we returned back to our hotel, had our lunch and took some rest. In the evening, we again explored the The Mall Road Market and with this our day spent happily. On the third day, we left for Dehradun early in the morning. We had SahastraDhara as a stoppage in between where students enjoyed in the river. Later on that day we visited and attained a lecture in Sericulture Institute about the formation of silk. After this we returned to the hotel where the students had games and dance. We enjoyed a lot that night.

On the last day of trip, we first went to robbers cave where we discovered the unseen beauty of nature after that we left for Rajaji National Park, their jungle Safari's were already booked and in the evening we took the Safari and explored the Rajaji National Park we saw many wild diversity of animals, and visited a temple situated there too.

After this we rested for a while in a Dharmshala located near Haridwar, At 10 pm we started our return journey and reached Delhi before the sunrise and the gloomy end of the journey arrived.... Apart from capturing thousands of photos we have also made thousand of memories..

BOTANICAL EXCURSION TO DEHRADUN, MUSSOORIE

Aadil Ashraf, B.Sc. Botany (H)II year



A five day long excursion to Dehradun, Mussoorie by the Department of Botany, Zakir Husain Delhi College was undertaken from 11-16 October, 2018. Where we explored the pioneer institution in an arena of Forestry Research in India that is FOREST RESEARCH INSTITUTE (FRI), WILDLIFE INSTITUTE OF INDIA (WII) in Dehradun. And the visits to the different places in Mussoorie and Dhaunlati literally left us numb. A peek into the numbness on the peak of nature numb mountain talk, diverse Flora and Fauna, spelllet autumn overloading a Valley covered in haze which explained us vividly this nature filled with beautiful species and desires for acknowledge.

Our visits to different places :-

Day 2 :- DEVPURA RIVER TRAIL, SAHASTRADHARA AND MUSSOORIE LAKE

We reached Mussoorie on 13 October. The name Mussoorie taken from the word Mansoor which is a shrub which is indigenous to the area. And that's why people used to call Mansouri instead of Mussoorie. On the second day we went

to Sahastradhara, meaning hundred fold spring, is one of the most popular tourist destinations located in Dehradun in Uttarakhand state of India. It is at about 11 km from the city of Dehradun known for its magnificent nature attracts us. It rejuvenates our soul and mind. On the same day in evening we went to Mussoorie lake. It is known for its serene beauty and calm nature. It is located at 6 km before Mussoorie on the Dehradun-Mussoorie road. Mussoorie lake looks magnificent during monsoon and it gives a mesmerizing view of Doon Valley. It is a manmade lake which was developed by City Board and the Mussoorie - Dehradun developmental Authority. It is also well known for boating.

Day 3 :- DHANAULATI ECO PARK AND GUN HILL POINT

Then on the third day of our excursion we went to Dhanaulati Eco Park. It is one of the most visited attractions. The mesmerizing part of it is the greenery with beautiful tall trees in the foothills of Garhwal, Himalayan range. It is well maintained Park by Government. It is a good place

for the people who are interested in Ecology and Botany.

The views of Himalaya and Deodar trees, the gardens, the monkeys everything adds up the nature there are food vendors who sell ginger tea and noodles, chips to bang our hunger. And then we went to Gun hill point in the beautiful evening of Queen of Hills Mussoorie. And it is a second highest peak of Mussoorie, at an altitude of 2,024 m. During the colonial rule, Gunhill had a gun mounted on top of it. Everyday at mid-day, the gun was fired from the top of hill so that people could adjust their watches accordingly. It gives an enthralling view of highest Himalayan ranges. And the cable cars run between the Hall and Gun Hill more than 100 times.

Day 4 :- KEMPTON FALLS AND COMPANY GARDEN

On 15th October, it was the last day of our excursion trip. We went to Kempton Falls the place

itself brings an immense pleasure. Kempton Falls is a waterfall in Ram Gaon and at the south of Kempton, in the Tehri Garhwal District of Uttarakhand, India. It is 13 kilometres (8 mi) from Mussoorie and nearly 1364 meters above sea level. Kempton Falls were developed as a tourist destination by British officer John Meakin, around 1835. The name Kempton is derived from the word 'camp-tea'. We are through this place to enjoy trekking up to the pristine falls and see the cascading waters which are crystal clear. The healthy climate of the place was rejuvenating our mind, body and soul. And after the Kempton Falls we moved to the company garden which were made by the British for their amusement. It is a home to beautiful and diverse flowers there we majorly saw *Ginkgo biloba*, a mini lake and artificial waterfall enhances its beauty, for kids play it is an amusement park.

MCLEODGANJ AND TRIUND; AN EDUCATIONAL CUM EXCURSION TRIP

AchyutRanjanGogoi, B.Sc. (H) Chemistry, III YEAR

Life, for most people, is a mad rush from one place to another, from one activity to another, trying to gather as much information as possible. In this process, people tend to forget, who they are and what they are. There is no time to ponder and wonder. They tend to forget the values of life. Traveling is the best way to get out of this rat race and it gives us an opportunity to experience life in different ways. Scientifically, it is shown that traveling also gains you more confidence and a great way to develop cultural sensitivity. Not to mention if you travel abroad, you can most likely be submerged into a second or third language. For me, traveling is something that absolutely blows my mind. Seeing something that you have never seen before, being places that people live every day and forget the beauty of their home and become absolutely in awe of the surroundings, and knowing that sometimes places are so different from where you're familiar.

Recently we had the privilege of visiting Mcleodganj and Triund, Himachal Pradesh as a part of our departmental educational tour. Chemistry department apart from its incredible presence in academics, also give equal emphasis on other co-curricular activities so as to ensure harmonious personality development among its students. As a part of its personality development program, Chemunicate: The Chemistry Society organized a departmental tour to Mcleodganj and trekking to Triund from 1st of March to 5th of March, 2019. 25 Students and teachers embarked on their journey on 1st of March at 8.30 PM. The next morning, we reached Mcleodganj and our entire team was accommodated in Himgiri Resort. The resort is located on the top of the hill in Naddi, Mcleodganj and it offers spectacular views of the Dauladhar ranges. 4 students were provided with 1 room and when we reached our rooms, we

were completely mesmerized by the panoramic views from its balcony which no photography can do justice to!

The same day we went to visit The Dalai Lama Monastery. The monastery has a very quiet and peaceful environment and the guide gave us a brief glimpse of Buddhism. After that we went to visit Bhagsu Water Fall. Bhagsu water fall is a beautiful picturesque tourist destination about 2km away from Mcleodganj and a km hike to the top from Bhagsunath Temple. After completing the hike to Bhagsu Water Fall, all of us were very much tired and we came back to hotel.

The next day i.e. 2nd March was an exciting day for all us. We started early in the morning and started our trekking towards Triund top through Dauladhar ranges. The entire trekking was an amazing experience for us and after completing about 5km of hike; we reached the Triund check point and had our lunch. From there, Triund top was another 6 km of hike but unfortunately the trekking was closed due to snowfall and hence we had to return halfway through the trekking. Overall the trekking experience was an amazing one for all of us. We were lucky to have found snow in our trekking route and we spent a lot of time there playing around with snow. The next day morning we checked out of the hotel and visited the beautiful Dharamshala Stadium. From there we went to visit another temple in Dharamshala and after that we had our lunch. After having our lunch, our return journey started leaving behind the picturesque sceneries of the vast Blue Mountains and white snows.

The next day morning we reached Delhi and resumed our day to day life. During the trip, all of us created many happy memoires together which we will cherish for our

lifetime. These happy memories will keep on reminding us about the bonding that we share as classmates and most importantly as good friends.

SPECTRUM