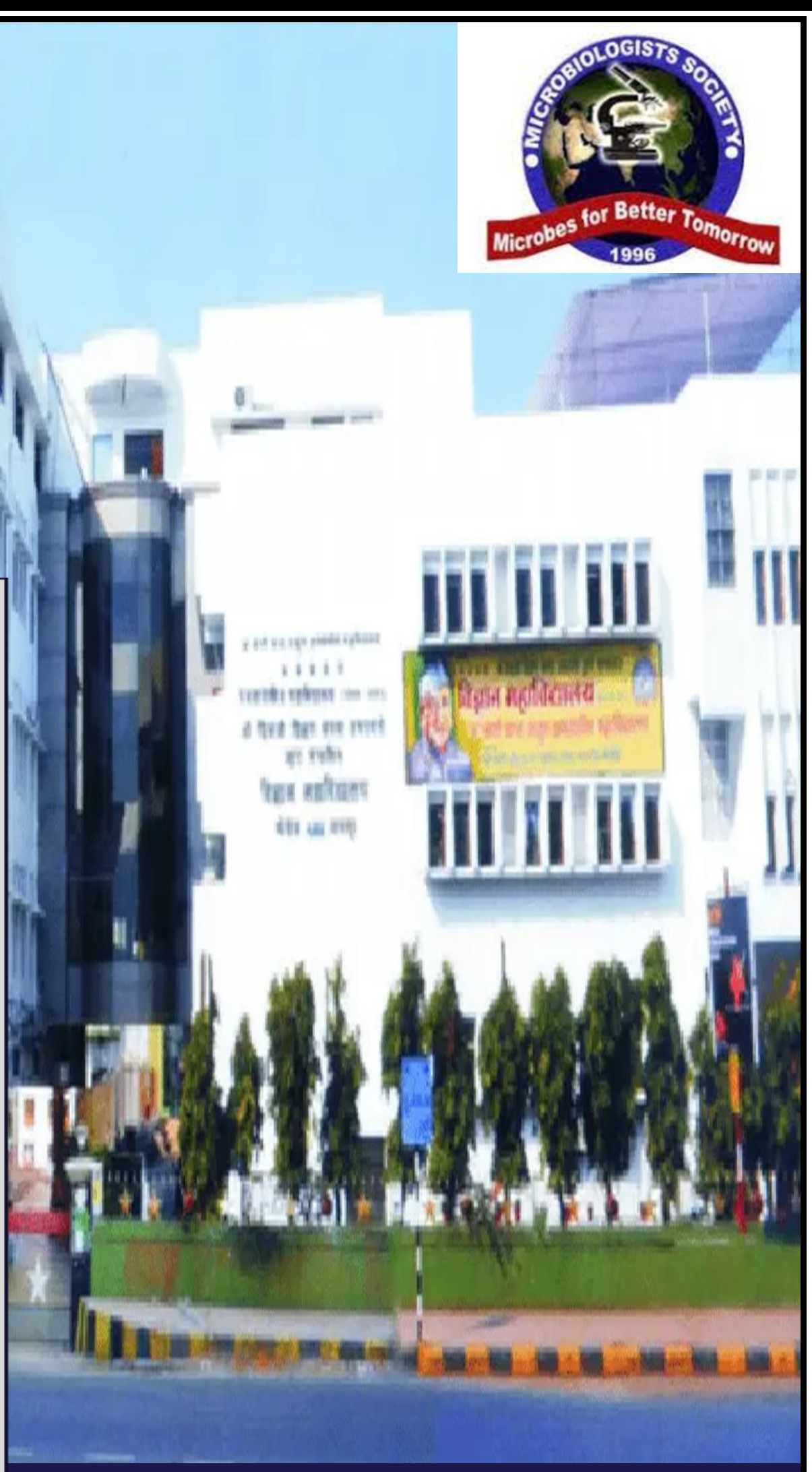
SCIENTIFIC CALENDAR

2022



Presented By:

- KANCHAN DILIP SELUKAR
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M.Sc Ist yr MICROBIOLOGY

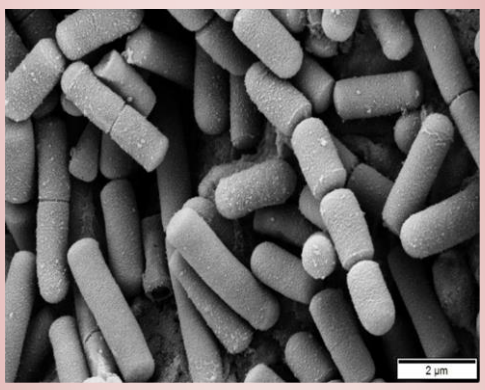
SHRI SHIVAJI EDUCATION SOCIETY AMRAVATIS SCIENCE COLLEGE, CONGRESS NAGAR, NAGPUR
http://sscnagpur.ac.in
MICROBIOLOGISTS SOCIETY, INDIA

A bottle of wine contains more philosophy than all the books in the world.

-Louis Pasteur

Ferdinand Cohn **(Founder of Bacteriology and Microbiology)**

Rebecca Craighill **Lancefield (well known for serological classification of *β-hemolytic streptococcal bacteria*)**



Bacillus cereus

Bacillus cereus is a facultatively anaerobic, toxin producing, gram-positive bacteria that canm be found in siol vegetation anf even food. This may cause two types of intestinal illness, one diarrheal, and one causing nausea and vomiting.It can quickly multiply at room temperature. *B.cereus* has also been implicated in infections of the eye, respiratory tracts , and in wounds. *B.cereus* and other members of bacillus are not easily killed by alcohol,they have been known to colonize distilled liquors and alcohol soaked swabs and pads in numbers sufficient to cause infection.

JANUARY 2022

M	T	W	T	F	S	S
31					1 Global Family Day	2
3	4 Richard Michael Krause	5 Rebecca Craighill Lancefield	6	7	8	9 Har Gobind Khorana
10	11	12 National Youth Day	13	14	15 Indian Army Day	16
17	18	19	20	21	22	23
24 Ferdinand Kohn National Girl Child Day International Day of Education	25 National Tourism Day	26 Heinrich Anton de Bary Republic Day	27	28	29	30 World Leprosy Day

World Leprosy Day – **30th JAUNARY:** World Leprosy Day is observed internationally every year on the last Sunday of January to increase the public awareness of leprosy or Hansen's Disease. This date was chosen by French humanitarian Raoul Follereau as a tribute to the life of Mahatma Gandhi who had compassion for people afflicted with leprosy. The day began to be observed in 1954. Leprosy is one of the oldest recorded diseases in the world. It is an infectious chronic disease that targets the nervous system, especially the nerves in the cooler parts of the body: the hands, feet, and face.

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BIRTH DATES OF FAMOUS SCIENTISTS IN THIS MONTH:

- JANUARY 04, 1925 **Richard Michael Krause** **Famous as:** Microbiologist and Immunologist
  He was the director of the National Institute of Allergy and Infectious Diseases from 1975 to 1984. The persistent theme underlying his research concerned the substances in bacteria that stimulate the body's immune system. This is best exemplified by his research on the immune response to streptococcal polysaccharides. This led to an examination of the genetic factors that influenced the immune response. In recognition of his research achievements, he was elected to the U.S. National Academy of Sciences in 1977.
- JANUARY 05, 1895 **Rebecca Craighill Lancefield** **Famous as:** Microbiologist and Bacteriologist
  Lancefield is best known for her serological classification of β-hemolytic streptococcal bacteria, Lancefield grouping, which is based on the carbohydrate composition of bacterial antigens found on their cell walls. She is also responsible for the serological typing of Group A Streptococci.

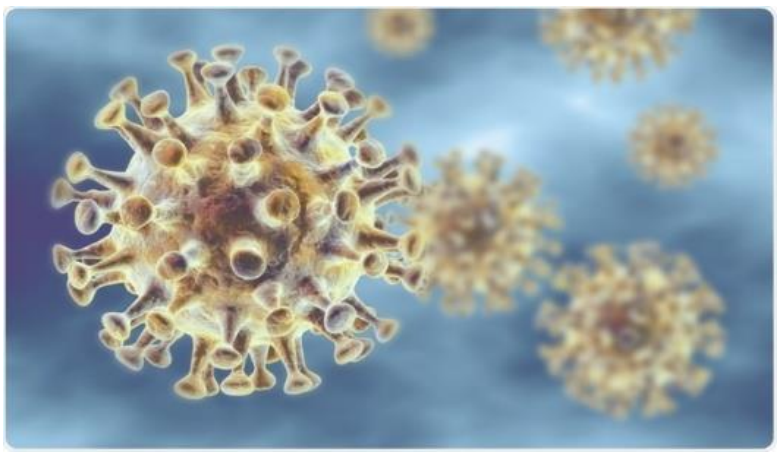
- JANUARY 09, 1922 **Har Gobind Khorana** **Famous as:** A biochemist.
  He is known for successfully demonstrating the role of nucleotides in protein synthesis and honoured with Nobel Prize in Medicine.
- JANUARY 24, 1828 **Ferdinand Kohn** **Famous as:** Founder of Bacteriology and Microbiology
  Cohn made significant contributions to the field of botany. He was the first person to classify algae as plants. Ferdinand Cohn received the prestigious Leeuwenhoek Medal in 1885.

- JANUARY 26, 1831 **Heinrich Anton de Bary** **Famous as:** Microbiologist and Mycologist
  German surgeon and botanist Heinrich Anton de Bary is regarded as the pioneer of plant pathology and mycology. Apart from teaching botany, he chalked the life cycles of many fungi and also coined the term symbiosis to explain the mutually beneficial co-existence of many orgnanisms, such as fungi and algae.

INVENTIONS OF THE MONTH:

- JANUARY 01, 1982 Zworykin a Russian engineer invented the cathode-ray tube**.**
- JANUARY 11, 1955 Lloyd Conover patented the antibiotic tetracycline.
- JANUARY 20, 1857 William Kelly patented the blast furnace for manufacturing steel.
- JANUARY 22, 1895 "Lifebuoy" soap was trademark registered.

BRANCH OF MICROBIOLOGY:



Virology: Virology is a subfield of microbiology.Virology is the scientific study of viruses – submicroscopic, parasitic organisms of genetic material contained in a protein coat and virus-like agents. It focuses on the following aspects of viruses: their structure, classification and evolution, their ways to infect and exploit host cells for reproduction, their interaction with host organism physiology and immunity, the diseases they cause, the techniques to isolate and culture them, and their use in research and therapy. A major branch of virology is virus classification. Viruses can be classified according to the host cell they infect i.e animal viruses, plant viruses, fungal viruses, and bacteriophages (viruses infecting bacteria). Another classification uses the geometrical shape of their capsid (often a helix or an icosahedron) or the virus's structure (e.g. presence or absence of a lipid envelope). Viruses range in size from about 30 nm to about 450 nm, which means that most of them cannot be seen with light microscopes. The shape and structure of viruses has been studied by electron microscopy, NMR spectroscopy, and X-ray crystallography.

Aims and Scope: There are several reasons due to which students in recent times have an interest in this particular field. Some advantages of the course have been listed below:

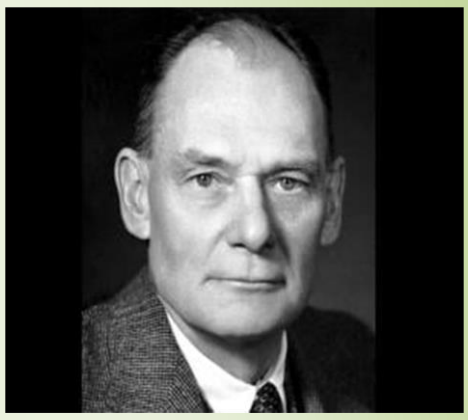
- The course is a great choice for the ones who wish to acquire theoretical knowledge and practical training in the field of animal virology, knowledge about treatment and prevention of viral infections, etc.
- The focus of the course is to provide the students with the ability to describe the various structures, virus latency, integrate experimental strategies, replication strategies of different viruses, interpreting data from experiments to find conclusions from them, etc.
- At the successful completion of the program, the students are experienced enough to get involved in the study of viruses for performing research and knowing about the diseases linked to it.
- These graduates can further undertake research studies or can even pursue a career by being a professional microbiologist or they may also take up teaching jobs in reputed colleges and universities.
- The professionals of the course are eligible to find lucrative job positions in reputed organisations. They can choose to be a Research Associate, Virologist, Assistant Professor, Laboratory Assistant, etc.
- They can find employment in areas like Pharmaceutical Companies, Research Centres, Private Clinics, Human Immunology Laboratory, Government Hospitals, reputed Colleges and Universities, etc.

ENVIRONMENTAL DAYS OF THE MONTH:

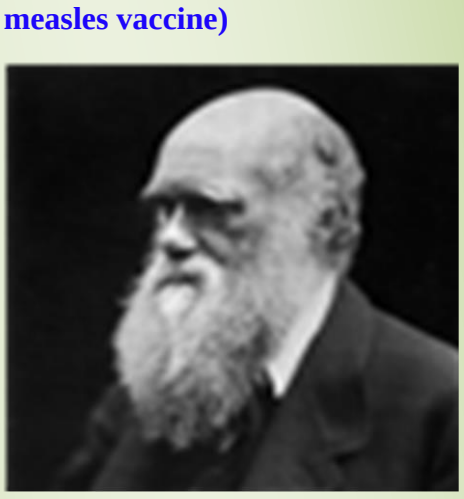
- National Road Safety Week - 1 to 7 JANUARY
- National Anti Leprosy Day- 30 JANUARY
- International Day of Education- 24 JANUARY

It is much more important to know what sort of patient has a disease than what sort of a disease a patient has.

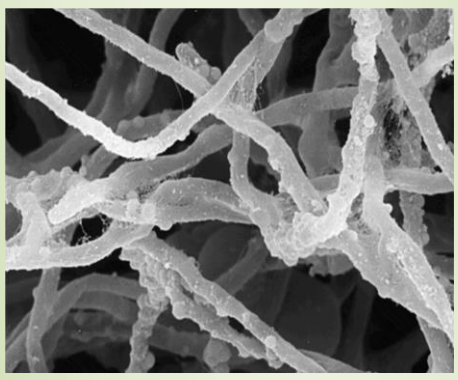
-Louis Pasteur



John Franklin Enders **(Father of Modern Vaccines – cultured poliovirus, isolated measlesvirus and developed measles vaccine)**

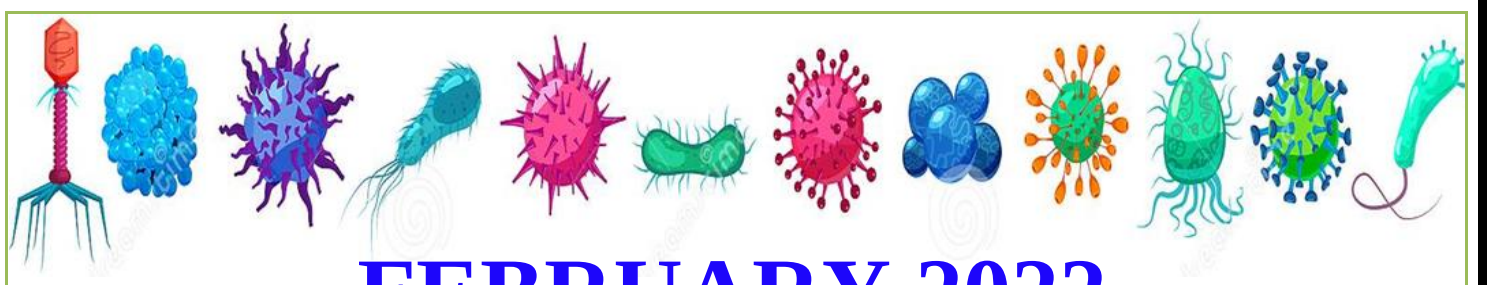


Charles Darwin **(contributed to the science of evolution by natural selection theory)**



Phanerochaete chrysosporium

Phanerochaete chrysosporium is a fungus that degrades wood. Because this microbe looks like white chalk on rotting wood, it is called a white rot fungus. When we eat crab, we break off the outer shell to get at the tasty meat inside. When *Phanerochaete* eats wood, it breaks down the lignin to get at the tasty (at least to this fungus) cellulose and hemicellulose. This fungus can break down lignin, the complex molecule which gives wood its strength. This fungus then eats the other parts of wood: cellulose and hemicellulose which give the fungus energy to grow.



FEBRUARY 2022

M	T	W	T	F	S	S
	1	2 Albert Schatz World Wetlands Day	3 Hans Cohen	4 World Cancer Day	5	6
7	8	9	10 John Franklin Enders	11	12 Charles Darwin International Day of Women's Health	13
14	15 International Childhood Cancer day	16	17 Peter Piot	18	19	20 Rene Dubos World day of Social Justice
21 August Von Wasserman	22	23	24	25	26	27
28 National Science Day						

**World Cancer Day – [4th FEBRUARY](): ** World Cancer Day is an international day marked on February 4 to raise awareness of cancer and to encourage its prevention, detection, and treatment. World Cancer Day is led by the Union for International Cancer Control (UICC) to support the goals of the World Cancer Declaration, written in 2008. The primary goal of World Cancer Day is to significantly reduce illness and death caused by cancer[1] and is an opportunity to rally the international community to end the injustice of preventable suffering from cancer.

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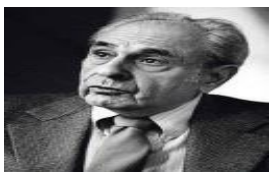
BIRTH DATES OF FAMOUS SCIENTISTS IN THIS MONTH:



- FEBRUARY 02, 1920 **Albert Schatz** **Famous as:** Microbiologist.
  He is best known as the discoverer of the antibiotic streptomycin along with Selman Waksman from cultures of a soil organism, *Streptomyces griseus*, and stated that it was active against *M. tuberculosis*. The New York Times placed Schatz and Waksman's 1948 streptomycin patent in the top 10 discoveries of the 20th century.

- FEBRUARY 03, 1923 **Hans Cohen** **Famous as:** Microbiologist.
  He was director-general of the Netherlands National Institute for Public Health and the Environment (RIVM) between 1984 and 1986. As a microbiologist Cohen worked on development of polio vaccines in the Netherlands.
- FEBRUARY 10, 1897 **John Franklin Enders** **Famous as:** The Father of Modern Vaccines.
  Enders was an american biomedical scientist and Nobel Laureate. He is best known for culturing poliovirus, isolating measlesvirus and developing measles vaccine.
- FEBRUARY 12, 1809 **Charles Darwin** **Famous as:** English naturalist, geologist and biologist.
  This day is known as Darwin Day. Charles Darwin is best known for his contributions to the science of evolution by natural selection. This theory was outlined in his seminal work on the *Origin of Species*, published in 1859.

- FEBRUARY 17, 1949 **Peter Piot** **Famous as:** Microbiologist.
  Peter Karel Piot is a Belgian microbiologist known for his research into Ebola and AIDS. Piot is the director of the London School of Hygiene and Tropical Medicine. Piot became a pioneering researcher into AIDS and held key positions in the United Nations and World Health Organization involving AIDS research and management. He is the author of 16 books and over 600 scientific articles.

- FEBRUARY 20, 1901 **Rene Dubos** **Famous as:** Microbiologist.
  René Jules Dubos was a French-American microbiologist, experimental pathologist, environmentalist, humanist, and winner of the Pulitzer Prize for General Non-Fiction for his book *So Human An Animal*. He is credited for having made famous the environmental maxim: "Think globally, act locally".

- FEBRUARY 21, 1866 **August Von Wasserman** **Famous as:** Bacteriologist.
  He is best known for his discovery of a universal blood-serum test for syphilis helped extend the basic tenets of immunology to diagnosis. "The Wassermann reaction," in combination with other diagnostic procedures, is still employed as a reliable indicator for the disease.Working at the Robert Koch Institute for Infectious Diseases in Berlin (1890–1913), Wassermann and the German dermatologist Albert Neisser developed (1906) a test for the antibody produced by persons infected with the protozoan *Spirochaeta pallida* (now known as *Treponema pallidum*), the causative agent of syphilis.

INVENTIONS OF THE MONTH:

- FEBRUARY 04, 1941 Roy Plunkett received a patent in for "tetrafluoroethylene polymers," better known as TEFLON.
- FEBRUARY 25, 1902 John Holland was granted a patent for a submarine.
- FEBRUARY 27, 1900 Felix Hoffman patented acetylsalicylic acid, better known as aspirin.

BRANCH OF MICROBIOLOGY:

Pharmaceutical Microbiology: Pharmaceutical microbiology is the application of microbiology to pharmaceutical and healthcare environments. It is an applied branch of microbiology which recognizes that the extremely wide variety of microorganisms in the environment is fertile with potentials, some for utility and others for hazard. Areas of utility include the fermentation of suitable substrate for the production of drugs, food supplements, and industrial solvents, as well as the development of the many vaccines that have been so crucial to the improvement in world health. Pharmaceutical microbiology also provides knowledge and understanding with respect to the significance of the presence of wide variety of microorganisms and toxins (microbial by-products like endotoxins and pyrogens) in pharmaceutical raw materials, intermediates, finished products and pharmaceutical production environments, as well as the microbiological control of pharmaceutical products, production environments, and people.

Aims and scope: The scope of pharmaceutical microbiology is wide ranging. However, its overriding function is the safe manufacture of pharmaceutical and healthcare preparations and medical devices. This involves risk assessment (both proactive and reactive), together with testing materials and monitoring environments and utilities. Microbiological contamination becomes a problem when it results in deterioration of pharmaceutical products. In drawing from risk assessment terminology, pharmaceutical microbiology centers on:

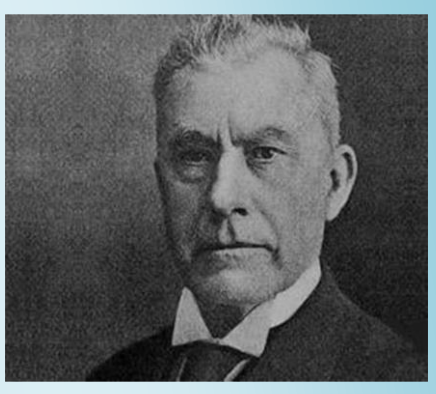
- Understanding the likelihood of product contamination arising.
- Understanding the severity of such contamination.
- Considering ways to minimize contamination.
- where contamination cannot be satisfactorily mitigated, using established and developing new methods to detect contamination.

ENVIRONMENTAL DAYS OF THE MONTH:

- World Wetlands Day - 02 FEBRUARY

Always trust a microbiologist because they have the best chance of predicting when the world will end.

-Teddie O. Rahube



Martinus Beijerinck **(discovered viruses-*Contagium vivum fluidum*)**

Max Schultze **(discovered protoplasm theory)**

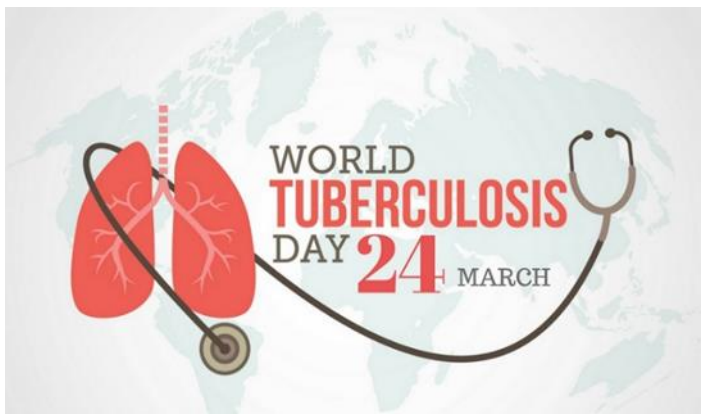
Agrobacterium

Agrobacterium is a gram-negative non-spore forming soil bacteria that cause tumors in plants. It is best known for its ability to transfer DNA between itself and plants, and for this reason it has become an important tool for genetic engineering. *Agrobacterium tumefaciens* causes crown-gall disease in plants. The bacterium, *Agrobacterium,* is like a mercenary commando. The anarchy that *Agrobacterium* causes plants is uncontrolled growth of cells into masses of tissue called tumors. Different species of *Agrobacterium* form different types of tumors. *Agrobacterium tumefaciens* causes a tumor called a crown gall. *Agrobacterium rhizogenes,* like the name implies, causes the sprouting of root tissue from an infection site, a condition known as hairy root. *Agrobacterium rubi* causes cane gall of raspberries. The weapon *Agrobacterium tumefaci ens* weilds is a circular bit of DNA called the Ti plasmid.

MARCH 2022

M	T	W	T	F	S	S
	1	2	3 Arthur Kornberg Peach Blossom Day World Wildlife Day	4 National Safety Day	5	6
7	8 International Women Day	9	10	11	12 World Kidney Day	13
14 Pi Day	15 Max Schultze World Consumer Rights Day	16 Martinus Beijerinck National Vaccination Day	17	18	19	20 World Oral Health Day
21 World Forestry Day	22 World Disable Day	23 World Water Day World Metrological Day	24 World Tuberculosis Day	25	26	27
28	29 Ann Kiessling	30	31			

**World Tuberculosis Day – [24th MARCH](): ** World Tuberculosis Day, observed on 24 March each year, is designed to build public awareness about the global epidemic of tuberculosis (TB) and efforts to eliminate the disease. In 2018, 10 million people fell ill with TB, and 1.5 million died from the disease, mostly in low and middle-income countries. This also makes it the leading cause of death from an infectious disease. World TB Day is one of eleven official global public health campaigns marked by the World Health Organization (WHO).



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BIRTH DATES OF FAMOUS SCIENTISTS IN THIS MONTH:

- MARCH 03, 1918 **Arthur Kornberg** **Famous as:** American Biochemist and Physician.
  He shared the 1959 Nobel Prize for Physiology or Medicine (with Severo Ochoa) for the discovery of mechanisms in the biological synthesis of deoxyribosenucleic acid. Kornberg showed not only how DNA molecules are duplicated in nature within bacterial cells, but also isolated the first DNA polymerisingenzyme (1958) and reproduced the process in test tube. His research included studying the nucleic acids which control heredity in animals, plants, bacteria and viruses
- MARCH 15, 1825 **Max Schultze** **Famous as:** Anatomist.
  Max Johann Sigismund Schultze was a German microscopic anatomist noted for his work on cell theory and discovery of protoplasm theory.
- MARCH 16, 1851 **Martinus Beijerinck** **Famous as:** Microbiologist and Botanist.
  He was one of the founders of virology and environmental microbiology. He is credited with the discovery of viruses, which he called *Contagium vivum fluidum*.He also made conceptual discoveries of tobacco mosaic virus, Enrichment cultures,Biological nitrogen fixation, Sulfate-reducing bacteria, Azotobater, Rhizobium, Desulfovibrio Desulfuricans, etc. He received Leewenhoek Model in 1905.

- MARCH 29, 1942 **Ann Kiessling** **Famous as:** Biologist and an inventor.
  She is best known for discovering the reverse transcription activity in normal human cells. She is the founder of the Special Program of Assisted Reproduction, New England.

INVENTIONS OF THE MONTH:

- MARCH 22, 1841 - Orlando Jones patented cornstarch.
- MARCH 31, 1981 - Ananda Chakrabarty patented a new single cell life form.

BRANCH OF MICROBIOLOGY:

Biotehcnology: Biotechnology is technology that utilizes biological systems, living organisms or parts of this to develop or create different products. The term biotechnology was first used by Karl Ereky in 1919, meaning the production of products from raw materials with the aid of living organisms. Brewing and baking bread are examples of processes that fall within the concept of biotechnology. Such traditional processes usually utilize the living organisms in their natural form (or further developed by breeding), while the more modern form of biotechnology will generally involve a more advanced modification of the biological system or organism. **Aims and Scope:** Biotechnology has rapidly emerged as an area of activities having marked impact on all aspects of human welfare ranging from food processing, protecting the environment, human health to quality of human life throughout the world. Some of the areas in which biotechnology is making marked contributions are Human Health, Animal Health, Agriculture, Medicine, Forestry Fisheries, Mining, Environment, Horticulture, Floriculture, Dairy, Food processing, Animal Husbandry, Renewable energy, Crime detection, parental dispute, Aquaculture etc. Biotechnology basically aims at improving the quality of human life and at protecting him from dangerous diseases. A candidate upon graduating with an MSc in Biotechnology degree can either opt for higher studies or look for a suitable job. The areas of the economy where Biotechnology graduates are hired are medicine or pharmaceuticals, engineering, food sector, institutes and universities, agricultural sector, research sector, animal husbandry etc.

- Research Programme: The highest level of education one can achieve in this domain is the PhD degree or research-based programs. One can choose the specialization of choice to do their PhD in and complete it within 3 to 5 years. Admission to PhD Biotechnology degrees is highly selective and involves an entrance examination and personal interview rounds.
- Management Programme: Another popular option is to pursue management programs like MBA or PGDM. These programs are helpful if one wishes to get hired in the management side of organizations. Admission is done through competitive exams like CAT, XAT, MAT, GMAT etc. Upon qualifying the exam, a group discussion and personal interviews are held.

ENVORONMENTAL DAYS OF THE MONTH:

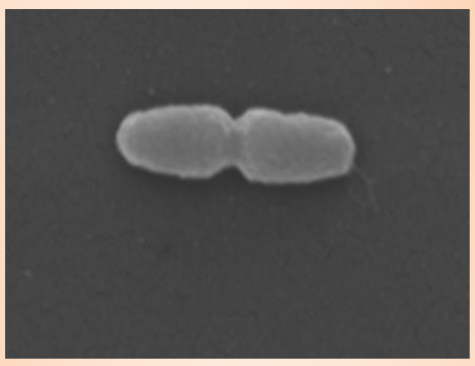
- Peach Blossom Day - 03 MARCH
- World Wildlife Day - 03 MARCH
- World Forestry Day - 21 MARCH
- World Water Day - 22 MARCH

"Without laboratories men of science are soliders without arms."

-Louis Pasteur

Ananda Mohan Chakruborty **(developed a genetically engineered pseudomonas)**

Felix d' Herelle **(co-discoverer of Bacteriophages)**



Anaerobic Toluene Degrader

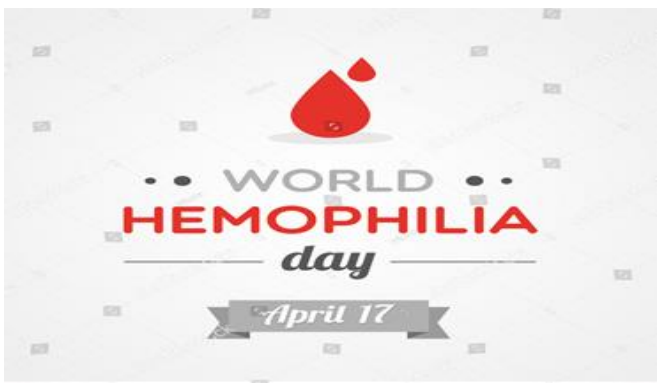
Kingdom: Eubacterium
Scientific Name: *Azoarcus tolulyticus*

This bacterium is an anaerobic toluene degrader. It was isolated from a gasoline-contaminated aquifer in Michigan. This organism was isolated and studied by Joanne Chee-Sanford as part of her doctoral dissertation research. It is being displayed as our "Microbe of the Week" (during April 1996) in honor of Dr. Chee-Sanford's recent successful defense of her dissertation project. Toluene is one of the most toxic components of gasoline. Bacteria that degrade (break down) toluene are being studied as a possible way to bioremediate (clean up) such contaminated water supplies. Although aerobic toluene-degrading microbes had been isolated previously, this bacterium was one of the first anaerobic toluene degraders found. Toluene-degrading bacteria that are aerobic cannot thrive in wet, underground environments like many aquifers.

APRIL 2022

M	T	W	T	F	S	S
				1	2	3 World Aquatic Animal Day
4 Ananda Mohan Chakrubort y	5 Hattie Alexander	6	7 International Food Festival Day World Health Day	8 William H. Welch	9	10
11 World Parkinson Day National Safe Motherhood Day	12	13	14	15	16	17 World Hemophilia Day
18 World Heritage Day	19	20	21 AIlaria Capua	22 Bruce Edwards Ivins World Earth Day	23	24
25 Felix d' Herelle World Malaria Day	26	27	28	29	30	

World Hemophilia Day – 17th APRIL: World Hemophilia Day is held annually on April 17 by the WFH. It is an awareness day for hemophilia and other bleeding disorders, which also serves to raise funds and attract volunteers for the WFH. It was started in 1989; April 17 was chosen in honor of Frank Schnabel's birthday.



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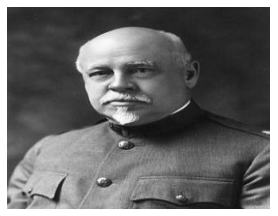
BIRTH DATE OF FAMOUS SCIENTIST IN THIS MONTH:

- APRIL04, 1938 **Ananda Mohan Chakruborty** **Famous as:** Microbiologist
  Ananda Mohan Chakruborty was an Indian-American Microbiologist, most notable for his work in directed evolution & his role in developing a genetically engineered pseudomonas. An "oil eating bacteria" also known as "superbug".
- APRIL05, 1901 **Hattie Alexander** **Famous as:** Peditician and Miocrobiologist

  Hattie Alexander was on American pediatrition and microbiologist. She is known for her development of the first effective remedies for Heamophilus influanzae infaction, as well as being one of the first scientists to identify and study antibiotic resistance.
- APRIL 08, 1850 **William H. Welch** **Famous as:** Bacteriologist, Pathologist



  William Henry Welch was an American physician, pathologist, bacteriologist, and medical school administrator. He was one of the "Big Four" founding professors at the Johns Hopkins Hospital. He was the first dean of the Johns Hopkins School of Medicine and was also the founder of the Johns Hopkins School of Hygiene and Public Health. Welch was more known for his cogent summations of current scientific work, than his own scientific research. The Johns Hopkins medical school library is also named after Welch. In his lifetime, he was called the "Dean of American Medicine" and received various awards and honors throughout his lifetime, and posthumously.
- APRIL21, 1966 **AIlaria Capua** **Famous as:** Virologist

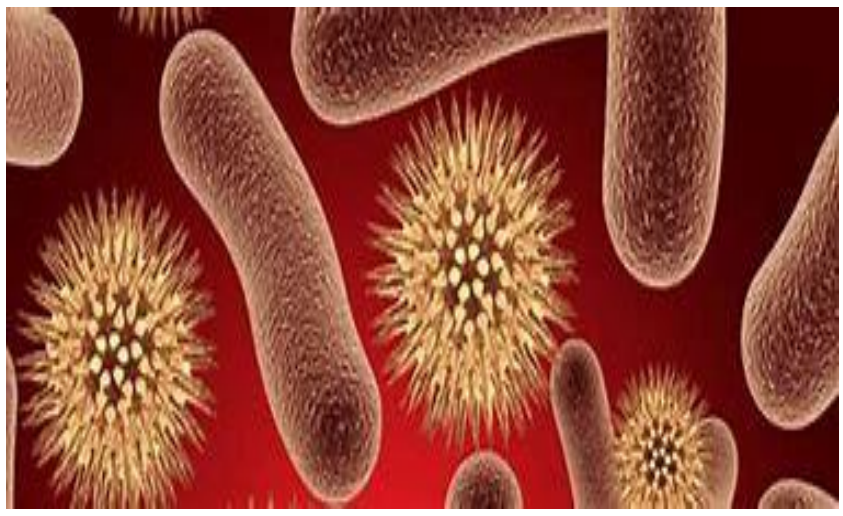
  Allaria Capua was virologist, best know for her research on influenza viruses, particularly avian (birds) influanza, and her efforts promating open access to genetic information on emerging viruses as part of pre-pandemic preparedness effects.
- April 22, 1946 **Bruce Edwards Ivins** **Famous as:** Microbiologist and Vaccinologist

  Bruce Edwards Ivins was an American microbiologist and vaccinologist. He was the key suspect responsible for the 2001 Anthrax attacks (by spare forming bacterium).
- April 25, 1873 **Felix d' Herelle** **Famous as:** Microbiologist
  Felix d' herelle was co-discoverer of Bacteriophages and experimented with the possibility of phage therapy. He has also been credited for his contributions to the larger concepts of applied microbiology.

INVENTIONS OF THE MONTH:

- April 1, 1578 English Physician William Harvey discovered blood circulation.
- April 9, 1974 Phil brooks received a patent for a dispossble suring- intravenous injections and infusion began as early as 1670.
- April 12, 1988 Philip Leder and Timothy Stewartan behalf of Harvard university were issued the first patent for a new animal life from- a genetically altered mouse.

BRANCH OF MICROBIOLOGY:



Bacteriology: Bacteriology is a branch of Microbiology that is concerned with the study of bacteria (as well as Archaia) and related aspects. Its a field in which bacteriologists study and learn more about the various characteristics (Structure, genetics, biochemistry and ecology etc.) of through which they cause disease in humans and animals. This has allowed resesrches in the field to not only get a better understanding of bacteria and also how to prevent/ treat/ manage diseases caused by these organisms. Bacteriology played on impotant role in the development of the fields of moleculer biology and genetics. Some of the most recent discoveries in bacteriology include-

- Plastic pollution negatively affects oxygen- producing bacteria.
- Promote the proliferation of 'goo' bacteria over "bad Ones".
- New bacteria species of the genus Enterobacter (E. Huaxiensis and E. Chuabaensis) discoved in Chaina.

Aim and Scope: A bacteriologist is responsible for studying various kinds of bacteria, which are constantly changing and evolving. They typically do their research in a laboratory, mostly for government or pharmaceutical agencies. Bacteriologists may specialize in a particular field, such as marine or veterinary bacteriology. These professionals use their academic knowledge and working experience to review bacteria growth and its effects on animals and the ecosystem. Bacteriologist plan and conduct laboratory experiments, as well as record and analyze data. Bacteriologists may work for pharmaceutical companies, developing drugs and vaccines, as well as for government agencies analyzing food and water for contamination.

ENVIRONMENTAL DAYS OF THE MONTH:

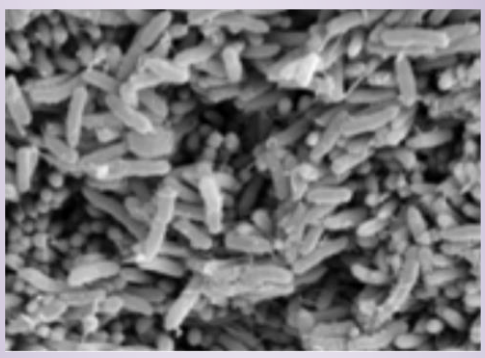
- World aquatic animal Day - 03 APRIL
- World Earth Day - 22 APRIL

"In the field of observation, chance in favours only the prepared mind."

-Louis Pasteur

Sir Ronald Ross **(proved the malaria transmitted by mosquitos)**

Hilary Lappin Scott **(second female president of society for General Microbiology)**



Serratia marcescens

In 1264 to honor of the miracle of Bolsena, Pope Urban instituted the feast of Corpus Christi (Body of Christ). Neither the Pope nor Peter the Priest could ever have known that a red bacterium, *Serratia marcescens*, was the probable cause of this blood-like substance on the communion bread. Most microbiologists are all too familiar with *Serratia marcescens*, one of the most frequent contaminants of Petri plates in lab. This same organism also grows on bread and communion wafers which have been stored in a damp place. This common microbe is found in soil, water, on plants and in animals. *S. marcescens* has been used to determine the survival and fate of bacteria in saline breast implants. *Serratia* appears to thrive in saline breast implants, living on the glucose that diffuses across the implant's outer shell. So maybe *S. marcescens* wasn't the miracle that the Pope expected, but this tiny organism does remind us of the miraculous invisible life that is all around.

MAY 2022

M	T	W	T	F	S	S
30	31 Anti Tobacco Day					1
2	3	4 World Asthma Day	5 Greenery Day	6	7 Tracy Palmer Green Up Day	8 World Thalassemia Day
9	10	11 National Technology Day	12	13 Sir Ronald Ross	14 Friedrich Karl Klein World Migratory Bird Day	15
16	17 World Hypertension Day	18 World AIDS Vaccine Day	19	20	21 National Endangered Species Day	22 International Day for Biological Diversity
23 Hilary Lappin Scott	24	25	26 Bruce Arnold Dunkar Stocker	27 Harold Ginsberg	28	29 David Bruce

World Thalasamia Day – 8th MAY: World Thalassemia Day is celebrated on 8th May, every year. It is also a day when the medical organizations around the world come together to plan and raise awareness about the disease. Camps are set up in various cities and villages to educate people about the dangers of Thalassaemia and teach them about prevention measures of it. It has a two-fold purpose. Firstly, on this day, we commemorate the people who lost their lives to thalassemia but are still cherished in our hearts. Secondly, this day is all about spreading awareness regarding this illness and extending support to people who have been diagnosed with thalassemia. The more people know about thalassemia, the more equipped they would be to deal with the illness.

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BIRTH DATES OF FAMOUS SCIENTISTS IN THIS MONTH:

- MAY 07, 1967 **Tracy Palmer** **Famous as:** Microbiologist
  Tracy Palmer FRS FRSE is a professor of Microbiology in the Biosciences Institute at Newcastle University in Tyne and Wear, England. She is known for her work on the Twin-Arginine Translocation (TAT) Pathway.
- MAY 13, 1857 **Sir Ronald Ross** **Famous as:** Zoologist and Medical Doctor
  He was a British Medical Doctor who received the Noble Prize for Physiology or Medicine in 1902 for his work on the Transmission of malaria. His discovery of the malarial parasite in the Gastrointestinal tract of a mosquito in 1897 proved the malaria transmitted by mosquitos.

- MAY 14, 1869 **Friedrich Karl Klein** **Famous as:** Microbiologist and Pharmacologist
  He became co-worker of Robert Koch, describe the developing cycle of the Trypanosoma stages inside the Tsetse flies.
- MAY 23, 1955 **Hilary Lappin Scott** **Famous as:** Microbiologist
  Her field of research is Microbial Biofilm. In 2009 she was elected as the second female president of society for General Microbiology in 70 years and served in this role until 2012.

- MAY 26, 1917 **Bruce Arnold Dunkar Stocker** **Famous as:** Microbiologist and Immunologist
  He was professor of Microbiology and Immunology at Standford University from 1966 to 1987. He researched the *Salmonella* bacteria helping to develop more effective vaccines.
- MAY 27, 1917 **Harold Ginsberg** **Famous as:** Microbiologist and Virologist
  He made early discoveries in Virology and infectious diseases. Ginsberg discovered a pattern of Hepatitis infection in those individuals who had received blood transfusions.
- MAY 29, 1855 **David Bruce** **Famous as:** Microbiologist and Pathologist
  He was Australian born British Pathologist and Microbiologist who investigated Malta fever and African trypanosomasis. He discovered a Protozoan parasite transmitted by insect, later named *Trypanosoma brucei* after him.

INVENTIONS OF THE MONTH:

- MAY 14, 1686 Daniel Gabriel Fahrenheit invented a thermometer.
- MAY 14, 1853 Gail Borden invented her process for condensed milk.
- MAY 25, 1948 Andrew Moyer was granted a patent for a method of mass production of penicillin.

BRANCH OF MICROBIOLOGY:

Phycology/Algology: Phycology is a branch of Microbiology. Phycology is the scientific study of Algae. Also know as Algology. Algae are important as primary producer in aquatic ecosystems. Most algae are eukaryotic, photosynthetic organisms that live in wet environment. They are distinguished from the higher plants by a lack of true roots, stems or leaves. They do not flower. Phycology includes the study of Prokaryotic forms knows as blue-green algae or Cyanobacteria. A number of microscopic algae also occur as symbionts in lichens.

Aim and scope: The tasks an Algologist is expected to perform include:

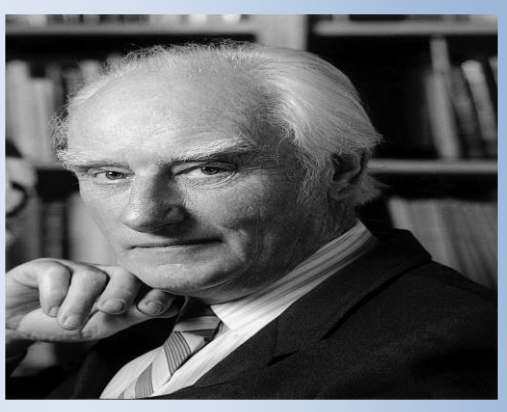
- Studying, identifying and classifying algae plants for use as edibles and soil manure.
- Visiting areas such as sea-sides, river-sides, swamps for study of algae on natural surroundings.
- Collecting specimens of different varieties of algae for study in laboratory.
- Studying nitrogen content, food value, etc. of algae for economic exploitation.
- Propagating methods for rowing particular type of algae to enrich nitrogen content of soil for paddy cultivation.
- Studying fresh water algae or marine algae.
- Controlling and growing algae in water circulation system.

ENVIRONMENTAL DAYS OF THE MONTH:

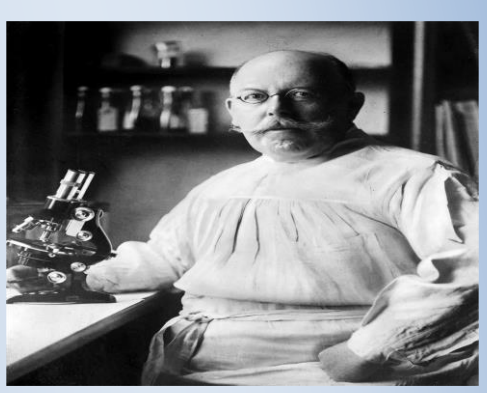
- Green Up Day - 1st SATURADAY OF MAY
- Greenery Day - 05 MAY
- World Migratory Bird Day - 2nd SATURADAY OF MAY
- National Endangered Species Day - 21 MAY
- International Day for Biological Diversity - 22 MAY

"Imagination is powerful than knowledge."

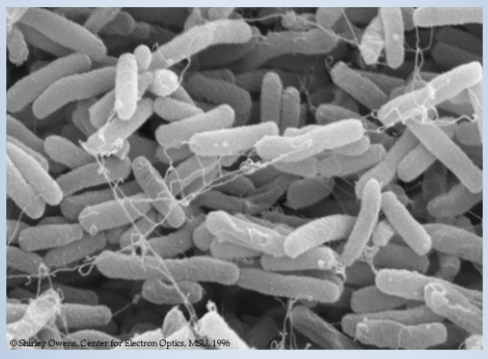
-Albert Einstein



Francis Crick **[determined the molecular structure of deoxynucleic acid (DNA)]**



Friedrich August Johannes Loffler **[created Löffler's serum, a coagulated blood serum and also discovered diphtheria (*Corynebacterium diphtheriae*) and foot-and-mouth disease (Aphthovirus)]**



Escherichia coli

Kingdom- Eubacterium

Scientific name- *Escherichia coli*

E. coli is the lab rat of the bacterial World. E. coli is very popular for use in research because it is so easy to grow, with a fast-doubling time of only 20 minutes.

E. coli was discovered in **1885** by **Theodor Escherich**, a German Bacteriologist. *E. coli* is used in industrial bacteriology to produce enzymes.

E. coli is a normal resident of the large intestine in healthy people. It is a type of probiotic organism because it crowds out disease causing bacteria. *E. coli* also makes vitamin K which humans required to be healthy.

JUNE 2022

M	T	W	T	F	S	S
		1 World Reef Day	**2**	**3** Werner Arber	**4**	**5** World Environment Day Solomon Memorial Day
6	**7** World Food Safety Day	**8** Francis Crick World Oceans Day World Brain Tumor Day	**9** Coral Triangle Day	**10**	**11**	**12** World Day Against Child Labour
13 Jules Bordet	**14** World Blood Donor Day	**15** World Wind Day	**16**	**17**	**18**	**19** World Sickle Cell Awareness Day
20	**21** International Day of Yoga	**22**	**23**	**24** Friedrich August Johannes Loffler	**25**	**26** International Day Against Drug Abuse and Illicit Trafficking
27 Wilhelm Burgdorfer	**28**	**29**	**30**			

World Brain Tumor Day – 8th JUNE: World Brain Tumor Day is observed on 8th June, every year. German Brain Tumour Association (Deutsche Hirntumorhilfe e.V.), a nonprofit organisation, first marked this day in the year 2000 to spread awareness about the brain tumour among the general public. Deutsche Hirntumorhilfe was founded in 1998 and have more than 500 registered members from fourteen nations. It provides support to the patients and their family members besides scientists and health professionals.

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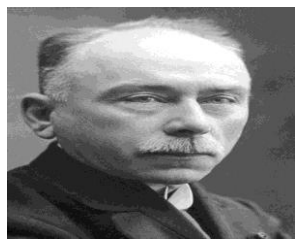
DATES OF BIRTH OF FAMOUS SCIENTISTS IN THIS MONTH:

- JUNE 03, 1929 **Werner Arber** **Famous as-** Microbiologist and Geneticist
  His discovery of restriction endonucleases earned him the prestigious Nobel Prize in Physiology or Medicine in 1978; he shared the award with Daniel Nathans and Hamilton Smith. Arber's work alongside Nathans and Smith led to the progression of recombinant DNA technology. Werner Arber is also credited with co-founding the World Cultural Council.
- JUNE 08, 1916 **Francis Crick** **Famous as-** Biochemist
  He shared the 1962 Noble Prize for Physiology or Medicine with James Watson and Maurice Wilkins for the determination of the molecular structure of deoxynucleic acid (DNA), the chemical substance ultimately responsible for hereditary control of life functions. Crick and Watson began their collaboration in 1951, and published their paper on the double helix structure on 2 April 1953 in *Nature*.



- JUNE 13, 1870 **Jules Bordet** **Famous as-** Bacteriologist and Immunologist
  He discovered the complement, a complex of proteins in the blood that causes the distruction of foreign cells in an immune response. In 1906, he isolated the bacterium responsible for whooping cough, which is named after him- *Bordetella (Haemophilus) pertusis*- for which he developed a vaccine. Bordet's major work came when he shifted to Brussels from Paris and set up Pasteur Institute in Brussels. He set the foundation for the complement-fixation testing methods that enabled the development of the serological tests for syphilis.
- JUNE 24, 1852 **Friedrich August Johannes Loffler** **Famous as-** Bacteriologist
  His development of original methods of staining rendered an important and lasting service to bacteriology. Early in his career, he began a study of parasitic diseases. Among his discoveries was the organism causing diphtheria (*Corynebacterium diphtheriae*) and the cause of foot-and-mouth disease (Aphthovirus). His description of the diphtheria bacillus, published in 1884, was the originating cause of an antitoxin treatment. He also created Löffler's serum, a coagulated blood serum used for the detection of the bacteria.

- June 27, 1925 **Wilhelm Burgdorfer** **Famous as:** Scientist, Entomologist
  He discovered the bacterial pathogen that causes Lyme disease, a spirochete named *Borrelia burgdorferi* in his honor. Burgdorfer's research concerned the interactions between animal and human disease agents and their transmitting arthropod vectors, particularly ticks, fleas and mosquitoes. His research contributions are published in more than 225 papers and books, and cover a wide field of investigations including those on relapsing fevers, plague, tularemia, Colorado tick fever, Rocky Mountain spotted fever and other bacterial and viral diseases.

INVENTIONS OF THE MONTH:

- JUNE 05, 1984 Saftey cap for a medicine bottle patented by Ronald Kay.
- JUNE 07, 1954 The first laboratory built in the U.S. exclusively for studies in Microbiology.
- JUNE 08, 1983 The first triplets resulting from in-vitro fertilization were born at the Flinders Medical Center in Adelaide, Australia, named Aron, Jessica and Chenara Guare.
- JUNE 13, 1877 Louis Pasteur began his quest to develop an anthrax vaccine by visiting the slaughterhouse of Chartres to take blood samples from corpses of farm animals that have died of anthrax.
- JUNE 18, 1981 First genetically engineered vaccine was announced.

BRANCH OF MICROBIOLOGY:

Industrial Microbiology: Industrial Microbiology is a branch of applied microbiology in which microorganisms are used in industrial processes; for example, in the production of high-value products such as drugs, chemicals, fuels and electricity.

Louis Pasteur is the father of industrial microbiology

Microorganisms were used in industrial processes even before their existence was known. The production of fermented beverages and vinegar and the baking of bread are all traditional processes which have come down to use from time immemorial. From an industrial point of view the substrate in which microorganisms are grown are regarded as raw material and the microorganisms as the "chemical factory" since it converts the raw material into new products.

Aim and Scope: Industrial Microbiology graduates can prefer to do the jobs on completion of these programs or go for higher studies or research work.

- Candidates who wish to gain more knowledge in Industrial Microbiology can opt for MSc Microbiology or MTech Industrial Engineering.
- Candidates can take up jobs in private sectors mainly in pharmaceutical companies, research firms etc.
- Candidates can go for jobs in foreign countries as well.
- Candidates can also opt for teaching profession.

ENVIRONMENTAL DAYS OF THE MONTH:

- World Reef Day - 01 JUNE
- World Environment Day - 05 JUNE
- World Oceans Day - 08 JUNE
- Coral Triangle Day- 09 JUNE
- World Wind Day - 15 JUNE

"One sometimes finds what one is not looking for."

-Sir Alexander Fleming

Selman Waksman **(Discoverer of Actinomycin, Streptomycin and Neomycin)**

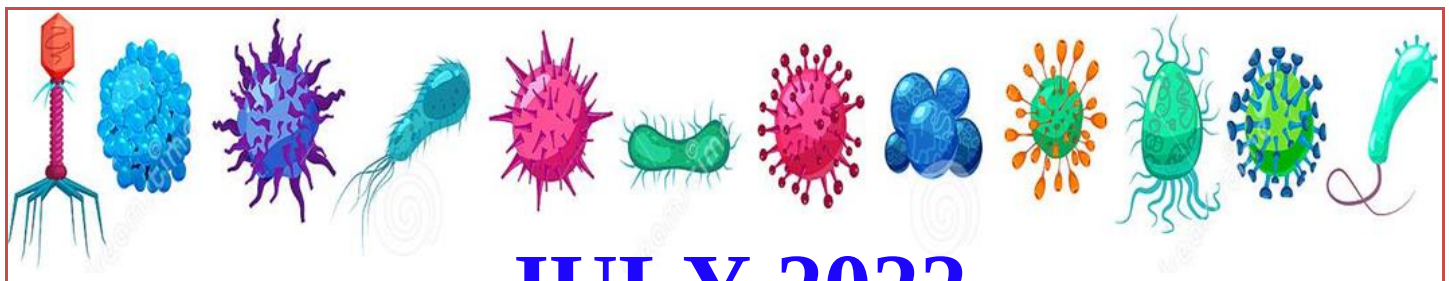
Albert Calmette **(developed the first antivenoms for snake bites, the Calmette's serum)**

Microbe from the Deep - *Bacillus infernus*

What lives under several kilometers of dirt and rock, away from oxygen and light? No plant nor animal can tolerate these conditions. Only microbes, like *Bacillus infernus* featured here, can thrive deep underground.

Deep underground most organisms would choke from lack of oxygen, but not this bacterium! It doesn't need to breath oxygen. Instead, it breathes iron or manganese dioxide. Bacteria that do not breathe oxygen are called anaerobes.

This particular microbe was found a mile beneathe the surface in Virginia. It was isolated by Dave Boone and others who discovered it in an NSF sponsored deep drilling project.



JULY 2022

M	T	W	T	F	S	S
				1 World Doctors Day	2	3
4	5 George Henry Falkiner Nuttall	6	7	8	9	10
11 World Population Day	12 Albert Calmette	13	14	15 World Youth Skills Day	16	17
18	19	20 Moon Day	21	22 Selman Waksman Chandrayaan 2 launching date	23	24
25 World Embryologist Day	26	27	28 World Hepatatis Day World Nature Conservation Day	29 International Tiger Day	30	31 Theobald Smith

World Hepatatis Day – 28th JULY: World Hepatitis Day, observed on July 28 every year, aims to raise global awareness of hepatitis — a group of infectious diseases known as Hepatitis A, B, C, D, and E — and encourage prevention, diagnosis and treatment. Hepatitis affects hundreds of millions of people worldwide, causing acute and chronic disease and killing close to 1.34 million people every year. Hepatitis causes liver diseases and can also kill a person.In some countries hepatitis B is commonest cause of cirrhosis and may also cause liver cancer(HCC). World Hepatitis Day is one of 11 official global public health campaigns marked by the World Health Organization (WHO).

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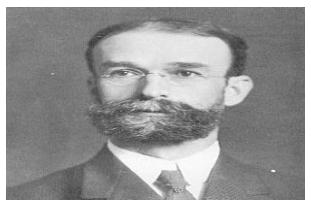
BITH DATES OF FAMLOUS SCIENTIST IN THE MONTH:

- JULY 05, 1862 **George Henry Falkiner Nuttall** **Famous as:** Bacteriologist
  He contributed much to the knowledge of parasites and of insect carriers of diseases. He made significant, innovative discoveries in immunology, about life under aseptic conditions, in blood chemistry, and about diseases transmitted by arthropods, especially ticks.
- JULY 12, 1863 **Albert Calmette** **Famous as:** Physician, Bacteriologist and Immunologist
  He discovered the Bacillus Calmette-Guérin, an attenuated form of *Mycobacterium bovis* used in the BCG vaccine against tuberculosis. He also developed the first antivenom for snake venom, the Calmette's serum. In 1894, he came back to France again and develop the first antivenoms for snake bites using immune sera from vaccinated horses (*Calmette's serum*).
- JULY 22, 1888 **Selman Waksman** **Famous as:** Discoverer of Streptomycin, Biochemists and Microbiologists
  Waksman discovered a total of twenty antibiotics through extensive research and development, of which actinomycin discovered in 1940, streptomycin in 1944 and neomycin in 1949 were the most prized invention. The discovery of streptomycin created a revolution in the medical world as it effectively put an end to the threat of tuberculosis. The discovery also gained him the most coveted award, Nobel Prize in Physiology or Medicine in 1952. His research on soil microbes helped in the discovery of streptomycin, the first successful treatment of tuberculosis, though he was sued by his student Albert Schatz for stealing credits.



- JULY 31, 1859 **Theobald Smith** **Famous as:** Pathologist, Epidemiologist, Bacteriologist
  He is widely considered to be America's first internationally significant medical research scientist. His work included the study of Texas cattle fever and the epidemiology of cattle infected by ticks transmitting protozoa. He also discovered a species of Salmonella, named for his chief Daniel E. Salmon, and studied anaphylaxis, then referred to as Theobald Smith phenomenon.

INVENTION OF THE MONTH:

- JULY 04, 1933 William Coolidge obtained a patent for the X-ray tube, popularly called the Coolidge tube.
- JULY 18, 1950 Sobin, Finlay, and Kane were issued a patent for producing terramycin, an antibiotic.
- JULY 22, 1873 Louis Pasteur received a patent for the manufacture of beer and treatment of yeast.
- JULY 24, 1956 A patent for an oral form of the antibiotic Penicillin was granted to Ernst Brandl and Hans Margreiter.
- JULY 25, 1876 Emily Tassey was granted a patent for an apparatus for raising sunken vessel.
- JULY 27, 1921 Canadian scientists Frederick Banting and Charles Best first isolated insulin and within a year, the first human sufferers of diabetes were receiving insulin treatments.
- JULY 31, 1790 Samuel Hopkins was issued the first U.S. patent for manufacturing potash.

BRANCH OF MICRIOBIOLOGY:

Genetic Engineering: Genetic engineering deals with the manipulation of genes under highly controllable laboratory conditions. This newly born technique has attracted the attention of microbiologists and is being applied in the food and drug industries, waste disposal, medicine, agriculture, oil pollution, and others. Genetic Engineering is a method of physically removing a gene from one organism and inserting it to another and giving it the ability to express the qualities given by that gene. Some examples of genetic engineering are Faster-growing trees, Bigger, longer-lasting tomatoes, Glow in the dark cats, Golden rice, Plants that fight pollution, banana vaccine, etc. The term “genetic engineering” was firstly used by Jack Williamson in Dragons Island a science fiction novel. In 1973 Paul Berg – father of genetic engineering invents a method of joining DNA from two different organisms.

Aim and Scope: Genetic engineering is a specialization of biotechnology. It can also be studied as a separate specialization. There are many undergraduate and postgraduate courses available in this field.

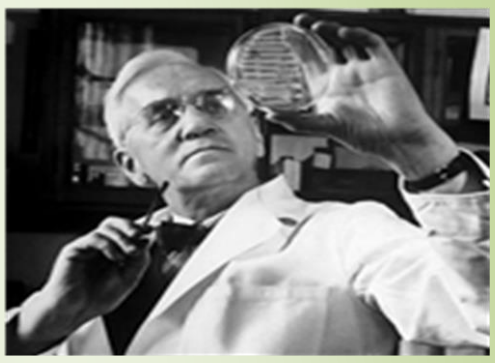
- After pursuing courses in genetic engineering, you can work in medical and pharmaceutical industries, research and development departments, agricultural sector, genetic engineering firms, chemical companies, etc. A genetic engineer can work in both private and public sectors.
- Genetic engineering graduates are required in government as well as private organizations.
- There is a great growth of genetic engineering in India as well as in abroad. With the increasing number of biotech firms in India, the future scope in genetic engineering is good.
- The graduates of this field can also opt teaching as a career. Numerous colleges are introducing genetic engineering course in their colleges and for that they recruit professionals of this field.
- To become a genetic engineering research scientist, you need a doctoral degree in a biological science. The genetic engineering research scientist can become project leaders or administrators of entire research programs.

ENVIRONMENTAL DAYS OF THE MONTH:

- World Zoonoses Day – 06 JULY
- International Tiger Day – 28 JULY

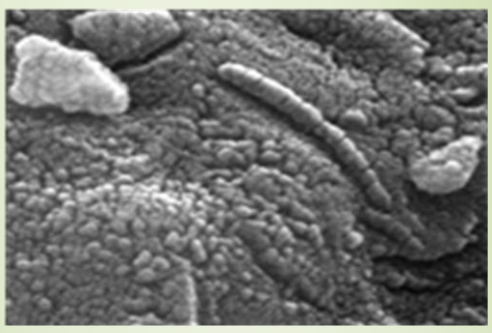
"The pure culture is the foundation for all research on infections."

-Robert Koch



Sir Alexander Fleming **(Father of Antibiotics)**

Albert Bruce Sabin **(developed the first oral polio vaccine)**



Martian Bacillus

In August of 1996 NASA scientists reported finding what look like fossils of microbes inside a meteorite (called ALH84001) thought to be from Mars. They believe the 4.5-billion-year-old rock was once a part of Mars. It was blasted from Mars by a huge meteor impact 16 million years ago. It fell to Earth in Antarctica 13 thousand years ago. A piece of the meteorite was discovered on an ice field in Antarctica by scientists in 1984. Inside of the meteorite, along cracks and fissures within the rock, scientists found mineral structures such as the one shown here. The NASA scientists have also found traces of chemicals within the cracks in the meteorite that they believe came from living organisms. These polycyclic aromatic hydrocarbons (PAHs) and carbonate globules may be products of microbial metabolisms. Visually, this structure certainly does resemble rod-shaped bacteria found on Earth. It is, however, quite small compared to terrestrial monerans; its size is closer to that of large viruses than to the size of most bacteria. Most scientists doubt that life currently exists on Mars.

AUGUST 2022

M	T	W	T	F	S	S
1 Dr John F. Mahoney World Breast Feeding Week	**2**	**3**	**4**	**5**	**6** Sir Alexander Fleming International Beer Day	**7**
8	**9** International Day of the World's Indigenous People	**10** Sir Almroth Wright	**11**	**12** International Youth Day World Elephant Day	**13** Frederick Sanger World Organ Donation Day	**14**
15 Independence Day	**16**	**17**	**18**	**19**	**20** World Mosquito Day	**21**
22	**23**	**24**	**25** National Eye Donation Fortnight	**26** Albert Bruce Sabin	**27**	**28**
29 International Day Against Nuclear Tests	**30**	**31**				

World Mosquito Day – 20th AUGUST: World Mosquito Day, observed annually on 20 August, is a commemoration of British doctor Sir Ronald Ross's discovery in 1897 that female mosquitoes transmit malaria between humans. Ross is responsible for the annual observance, having declared shortly after his discovery that the day should be known as World Mosquito Day in the future.

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BIRTH DATES OF FAMOUS SCIENTISTS IN THIS MONTHS:

- AUGUST 01, 1889 **Dr. John F. Mahoney** **Famous as**: Physician
  He developed penicillin treatment of syphilis. With an initial supply of penicillin, they confirmed other researchers' work on the efficacy of penicillin in the treatment of sulphonamide-resistant gonorrhoea.
- AUGUST 06, 1881 **Sir Alexander Fleming** **Famous as:** Bacteriologist
  He discovered penicillin. The active substance, which he named penicillin, initiated the highly effective practice of antibiotic therapy for infectious diseases.

- AUGUST 10, 1861 **Sir Almroth Wright** **Famous as:** Bacteriologist
  He developed an immunization against typhoid fever that protected British soldiers in world war I, saving lives infection. He was noted for creating autogenous vaccines, prepared from the bacteria harboured by the patient. He also developed vaccine against enteric tuberculosis and pneumonia.

- AUGUST 13, 1918 **Frederick Sanger** **Famous as:** Biochemist
  He was the twice recipient of nobel prize in 1958 for his work on the structure of protein especially structure of insuline molecule.
- AUGUST 26, 1606 **Albert Bruce Sabin** **Famous as:** Physician, Microbiologist
  He is best known for developing the first oral polio vaccine (1955). He was also kown for his research in the fields of human viral diseases, toxoplasmosis and cancer.

INVENTIONS OF THE MONTH:

- AUGUST 7, 1986 William J. Schroeder, the World's longest-surviving recipient of a permanent artificial heart, died at age 53 after living 620 days.
- AUGUST 12, 1930 Clarence Birdseye patented a method for packaging frozen foods.
- AUGUST 14, 1820 The first U.S eye hospital, was founded in New York City.
- AUGUST 31, 1968 Dr. Michael E. DeBakey of Houston led the first simultaneous multi-organ transplant from one donor to four recipients.

BRANCH OF MICROBIOLOGY:

Geochemical Microbiology: Role of microbes is coal, gas and mineral formation, prospecting for coal, oil and gas and recovery of minerals from low grade ores using microbes, is included here. Deposit of many important high-grade ores are diminishing at an alarming rate, and traditional methods of mining low grade ores are often prohibitively expensive. Microbial mining may provide a viable alternative in some cases such as copper and uranium. Study of microorganisms has answered many vital questions like the role of microorganisms in the formation of coal, petroleum, and utilization of raw materials (hydrocarbon;) for transformation into valuable chemicals. Organic matters derived from microorganisms accumulated in mud deposits of the ocean floor were buried in course of time by sedimentary action and were gradually converted into oil and gas. Continued study in this area of microorganisms will help us to tap our natural resources.

Aims and Scope: One can persue the following sectors:

- microbial weathering.
- microbial roles in the formation and degradation of specific minerals.
- mineralization of organic matter.
- petroleum microbiology.
- subsurface microbiology.
- biofilm form and function, and other interfacial phenomena of geological importance.
- biogeochemical cycling of elements.
- isotopic fractionation.
- Paleomicrobiology.

Applied topics such as bioleaching microbiology, geomicrobiological prospecting, and groundwater pollution microbiology are addressed.

ENVIRONMENTAL DAYS OF THE MONTH:

- International Day of the World's Indigenous People - 09 AUGUST
- International Youth Day - 12 AUGUST
- World Elephant Day - 12 AUGUST
- International Day Against Nuclear Tests - 29 AUGUST

Science is simply the word we use to describe a method of organizing our curiosity….

-Tim Minchin

***Edward Bausch* (developed microscopes and optical instruments)**

***Thomas D. Brock* (found the bacteria *Thermus aquaticus*)**

Sewage Sludge Microbe

Sludge Eaters: Sewage is home to many microbes. Many of these microbes are the main workers in cleaning up sewage sludge. They eat the sludge and release carbon dioxide gas, water and trace minerals. These weird, coiled-shaped microbes live with other microbes in a culture from sewage sludge.

Weird Shapes: Most bacteria are shaped like short or long rods, spheres or cork screws. The bacterium shown above is unusual because it is coiled. No one knows why they grow in coils.

Unknown Bacterium: Like most bacteria in nature, little is known about this bacterium. We know its shape and where it lives, yet know one knows what it eats, what microbes it is related to, or what it does in sludge.

SEPTEMBER 2022

M	T	W	T	F	S	S
			1 National Nutrition Week	**2**	**3** Sir Frank Macfarlane Burnet International Day of Peace	**4**
5	**6**	**7**	**8** Eye Donation Day International Literacy Day	**9**	**10** Thomas D. Brock	**11**
12	**13** Walter Reed	**14**	**15**	**16** World Ozone Day	**17** Merrill W. Chase International Microorganism Day	**18**
19	**20**	**21** World Alzheimer Day	**22**	**23**	**24**	**25** World Health Day
26 Edward Bausch World Environmental Health Day	**27**	**28**	**29**	**30**		

World Alzheimer Day – 21st SEPTEMBER: World Alzheimer's Day takes place every year on 21 September. World Alzheimer's Day is an international campaign to raise awareness and highlight issues faced by people affected by dementia. It is an opportunity for people and organisations to demonstrate how we can overcome these issues and help people live well with dementia.

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BIRTH DATES OF FAMOUS SCIENTISTS IN THIS MONTH:

- SEPTEMBER 03, 1899 **Sir Frank Macfarlane Burnet** **Famous as:** Physician, Virologist
  He was a recipient of Nobel Prize for Physiology or Medicine in 1960 with Sir Peter Medawar for discovery of acquired immunological tolerance to tissue transplants. He studied the nature of antibody formation and immune processes and developed the notion of immunological tolerance to explain why humans do not form antibodies to their own bodily constituents.
- SEPTEMBER 10, 1926 **Thomas D. Brock** **Famous as:** Microbiologist
  He found the bacteria *Thermus aquaticus*, which thrives at temperature of 70ºC (150ºF) or higher, because all their enymes are stable at very high temperature. This species of bacteria is used to help to create PCR.
- SEPTEMBER 13, 1851 **Walter Reed** **Famous as:** US Army Pathologist and Bacteriologist
  He led the experiments in Cuba (1900) that proved that yellow fever is transmitted by the bite of a mosquito. The Walter Reed Hospital in Washington, D.C., was named in his honour.

- SEPTEMBER 17, 1905 **Merrill W. Chase** **Famous as:** Immunologist
  He made groundbreaking discoveries in cellular immunology and experimental allergy. In the early 1940's, by transferring white blood cells between guinea pigs he found an immunity in the donor against the tuberculosis organism was also transferred. Thus he discovered a new class of immune response-cell-mediated immunity. Dr. Chase discovered that white blood cells, and not antibodies alone, were important instruments of the immune system. His findings laid the groundwork for later research that discovered the role of B cells, T cells and other types of white blood cells. Recognizing that other scientists were discovering multiple functions of the immune system, he established an independent Immunology laboratory at Rockefeller.

- SEPTEMBER 26, 1854 **Edward Bausch** **Famous as:** American Inventor
  He developed microscopes and optical instruments. He held a number of patents related to the design of microscopes.

INVENTIONS OF THE MONTH:

- SEPTEMBER 10, 1984 DNA fingerprinting was discovered in Leicester, England, by Alec Jeffreys.
- SEPTEMBER 20, 1952 Alfred Hershey and Martha Chase Published a report confirming DNA hold hereditary data.
- SEPTEMBER 26, 1818 The first transfusion in Great Britain using human blood at Guy's Hospital, London, by Dr. James Blundell.

BRANCH OF MICROBIOLOGY:

Food and Dairy Microbiology: Father of Food Microbiology – Louis Pasteur. Food and Dairy Microbiology is the study of the microorganisms that inhibit, create or contaminate food.
This includes the study of microorganisms causing food spoilage; pathogens that may cause disease (especially if food is improperly cooked or stored); microbes used to produce fermented foods such cheese, yogurt, bread, beer and wine and microbes with other useful roles, such as producing probiotics. Milk and dairy products constitute an important item of our food. These products are very suitable for microbial growth. The field of food and dairy microbiology is very broad, encompassing the study of microorganisms which have both beneficial and deleterious effects on the quality and safety of raw and processed foods. The primary tool of microbiologists is the ability to identify and quantitate foodborne microorganisms.

Aim and Scope: MSc Dairy Technology is one of the best paying fields where a qualified, experienced senior in the industry. Below mentioned are the future prospects that the students of MSc Dairy Technology can opt for:

- MSc Dairy Technology graduates can work in both private and corporate sectors.
- Candidates can also opt for Ph. D courses in various fields of agriculture as well.
- Dairy Product Development Director and Milk Commissioner are some of the Senior Positions which a candidate can aim to achieve.

ENVIRONMENTAL DAYS OF THE MONTH:

- National Nutrition Week- 1-7 SEPTEMBER
- International Literacy Day- 08 SEPTEMBER
- World Ozone Day- 16 SEPTEMBER
- International Microorganism Day- 17 SEPTEMBER
- World Environmental Health Day- 26 SEPTEMBER

The scientist is not a person who gives the right answers, he is one who asks the right questions.

-Claude Levi-Strauss

Antoni van Leeuwenhoek
(Father of Microbiology)

Rudolf Virchow **(Father of Pathology)**

Mummy-shaped diatoms

Kingdom: Protist
Scientific Name: *Hemitrichia serpula*

The large creatures in this image that look like mummy cases are diatoms. Diatoms are protists that grow a silica shell around themselves. Diatoms also grow on most soil. They grow on the surface layer of soil, where they can use sunlight to produce food via photosynthesis. There are two basic types of diatoms: round ones and elongated ones, like these. Elongated diatoms can move themselves about; round diatoms cannot. There may be as many as 10,000 species of diatoms. Huge accumulations of fossilized diatoms make up diatomaceous earth, which is used in toothpaste and in filters.

OCTOBER 2022

M	T	W	T	F	S	S
31					1 World Habitat Day	2 International Day of Non-Violence
3 World Habitat International Day	4 World Animal welfare Day	5	6	7	8	9
10	11 World Mental Health Day	12 World Arthritis Day Natural Disaster Reduction Day	13 Rudolf Virchow	14	15	16 World Anesthesia Day
17	18	19 Carlo Urbani	20	21 World Iodine Deficiency Disorder Day	22 Frederick Twort	23
24 Antoni van Leewen- hoek World Polio Day	25 Roger John Tayler	26	27	28 Ephraim Anderson	29	30 Daniel Nathans

World Arthritis Day – 12th OCTOBER: World Arthritis Day is an annual awareness day observed on October 12 in many countries throughout the world. Its main goal is to disseminate information about joint disorders that are collectively known as arthritis, as well as to raise public awareness of challenges that people with arthritis have to face every day. “Arthritis” is an umbrella term often used to describe any disorder that affects joints. Generally, by arthritis people mean one of the diseases where joint pain is primary, such as rheumatoid arthritis, osteoarthritis, gout, juvenile idiopathic arthritis, and others. However, arthritis can also be a secondary condition to a wide range of diseases, from psoriasis and celiac disease to Lyme disease and lupus.

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BIRTH DATES OF FAMOUS SCIENTIST IN THIS MONTH:

- OCTOBER 13, 1821 **Rudolf Virchow** **Famous as:** Scientist, Father of Pathology
  He was a German scientist who is referred to as the "Father of Pathology" and the founder of the field of Social Medicine.
- OCTOBER 19,1956 **Carlo Urbani** **Famous as:** Epidemiologist
  Carlo Urbani was the first WHO officer to identify the outbreak of the deadly SARS disease while diagnosing a patient other doctors had failed to diagnose properly.

- OCTOBER 22, 1877 **Frederick Twort** **Famous as:** English bacteriologist
  Twort wrote, "It seems, therefore, probable that the separate micro-organisms in the various subgroups are not to be regarded as distinct species, but as varieties or hybrids of one or more species". Twort suspected that the leprosy bacillus had a 'close relationship' with the tubercle bacillus, a species that was culturable.

- OCTOBER 24, 1632 **Antoni van Leeuwenhoek** **Famous as:** Scientist, Father of Microbiology
  Seventeenth-century Dutch scientist Antonie van Leeuwenhoek, also known as the *Father of Microbiology*, is remembered as a pioneer of microscopy. His contribution to microbiology included the discovery of spermatozoa, bacteria, and muscle fibers.

- OCTOBER 25,1929 **Roger John Tayler** **Famous as:** Astrophysicist
  He was a British astrophysicist who wrote a number of textbooks about stellar structure and evolution, plasma stability, nucleogenesis, and cosmology.

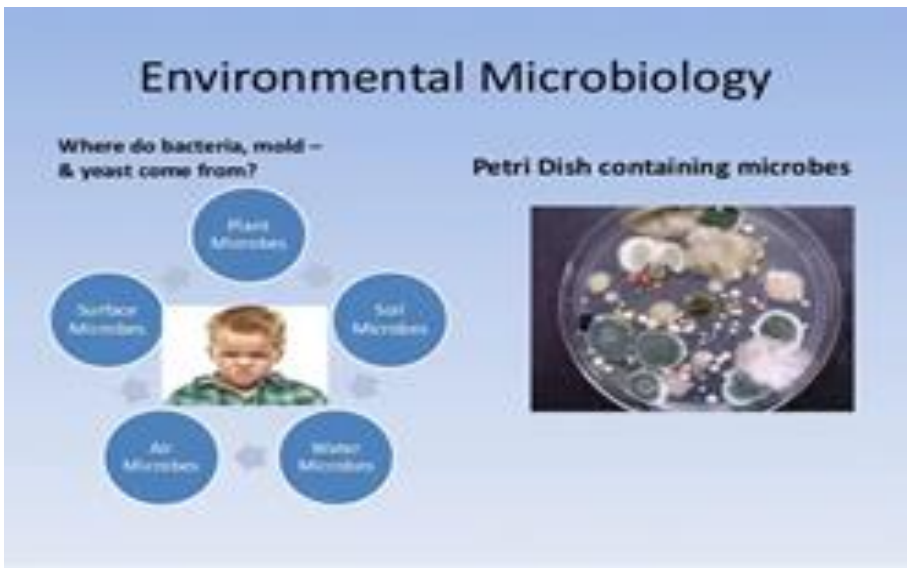
- OCTOBER 28, 1911 **Ephraim Anderson** **Famous as:** Bacteriologist
  He was best known for his work highlighting the human health dangers of drug-resistant bacteria created by antibiotics, in particular by low-dose antibiotic use in animal feeding.
- OCTOBER 30, 1928 **Daniel Nathans** **Famous as:** Microbiologist
  Daniel Nathans received the 'Selman Waksman Award' in Microbiology' in 1967. Nathans constructed a genetic map of the virus which helped in identifying the molecular structure of a cancer cell with the help of the restriction enzymes. He also took part in developing prenatal procedures for testing genetic diseases such as 'sickle cell anemia' and 'cystic fibrosis'.

INVENTIONS OF THE MONTH:

- October 1,1959 The first episode of Rod Sterling's "Twlight Zone" was copyright registered.
- October 4,1949 The patent for an antibiotic for typhoid was granted to Crooks, Rebstock, Controalis and Bartz.
- October 7,1975 Patent #3,909,854 was granted to Ysidro M. Martinez for a knee implant prosthesis.
- October 22,1940 Julian, Mayer and Krause received a patent for cortisone, used to treat rheumatoid arthritis, bursitis, adrenal insufficiency, allergies, diseases of connective tissue and gout.

BRANCH OF MICROBIOLOGY:

Environmental Microbiology: This is one of the most important branches of microbiology. The role of microbes in maintaining the quality of the environment is studied in this branch. Microbial influence in degradation and decay of natural waste; their role in biogeochemical cycles is all studied. Some of the recent researches have shown that certain bacteria can help in cleaning the oil spill, and this gives added significance to the study of environmental microbiology. Environmental microbiology is the study of microbial processes in the environment, microbial communities and microbial interactions.



Aims and Scope: Environmental Microbiology provides a high-profile vehicle for publication of the most innovative, original and rigorous research in the field. The scope of microbiology in this sector is vast. From understanding and using the microbes (primary decomposers) and bioremediation to pest control, microbiologists can work on an array of issues prevalent in this field. The diversity of current research on microbial processes in the environment, microbial communities, interactions and evolution and includes, but is not limited to, the following:

- the structure, activities and communal behaviour of microbial communities
- microbial community genetics and evolutionary processes
- microbial symbioses, microbial interactions and interactions with plants, animals and abiotic factors
- microbes in the tree of life, microbial diversification and evolution
- population biology and clonal structure
- microbial metabolic and structural diversity
- microbial physiology, growth and survival
- microbes and surfaces, adhesion and biofouling
- responses to environmental signals and stress factors
- modelling and theory development
- pollution microbiology
- extremophiles and life in extreme and unusual little-explored habitats
- element cycles and biogeochemical processes, primary and secondary production
- microbes in a changing world, microbially-influenced global changes
- evolution and diversity of archaeal and bacterial viruses
- new technological developments in microbial ecology and evolution, in particular for the study of activities of microbial communities, non-culturable microorganisms and emerging pathogen

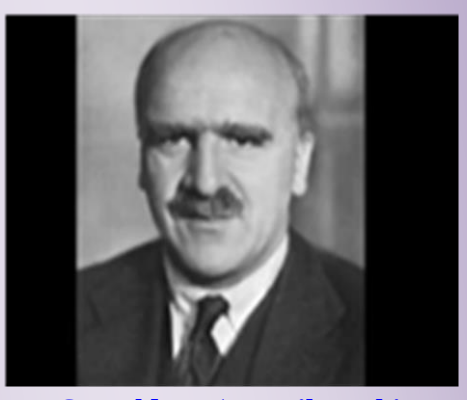
ENVIRONMENTAL DAYS OF THE MONTH:

- Wildlife Week - 1to7 OCTOBER
- World Animal welfare Day - 04 OCTOBER
- World Habitat DayInternational Day- 1st Monday of OCTOBER
- Natural Disaster Reduction Day- 2nd Wednesday of OCTOBER

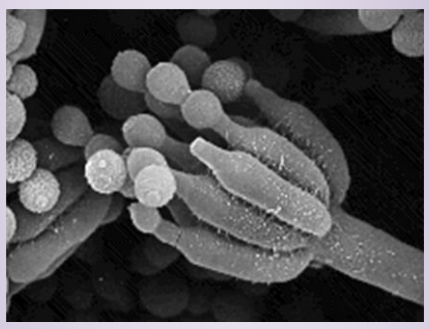
Every brilliant experiment, like every great work of art, starts with an act of imagination.

-Jonah Lehrer

***Jack W. Szostak* (created first yeast artificial chromosome)**



***J.B.S. Haldane* (contributed in the field of population genetics and evolution)**



A Thanksgiving Microbe: *Penicillium*

Microbe Name: *Penicillium*

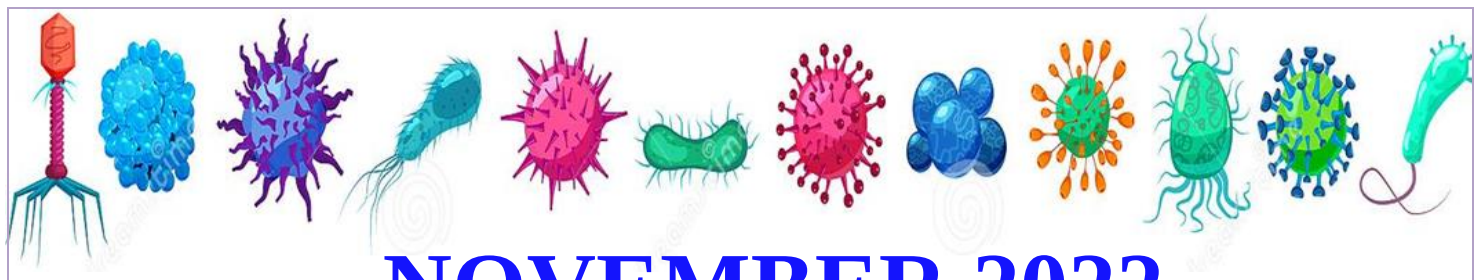
Next time at dinner when you give thanks for your food and for your loved ones, you might also want to give thanks for microbes like *Penicillium* that have benefited your health and your tastebuds.

Mold Makes Antibiotics

This amazing fungus produces the famous antibiotic, penicillin. In 1928. Alexander Fleming observed that a mold called *Penicillium notatum* produced a substance, later known as penicillin, that killed bacteria in its presence. This antibiotic was the first of many to be found and used to treat infections.

Mold Makes Cheese

Other varieties of *Penicillium* fungus give blue cheese and Roquefort cheeses their characteristic tastes and blue color.



NOVEMBER 2022

M	T	W	T	F	S	S
	1	2	3 Johannes Eugenius Bülow Warming	4	5 J.B.S. Haldane	6 International Day for Preventing the Exploitation of the Environment in War and Armed Conflict
7	8	9 Jack W. Szostak	10 World Immuni-zation Day	11	12 World Pneumonia Day	13
14 Childrens Day World Diabetes Day	15	16	17 Hans Zinsser	18	19	20 World Childrens Day
21 World Fisheries Day	22	23	24	25 Harry Martin Meyer, Jr. International Day for the Elimination of Violence against Women	26	27
28	29	30				

World Pneumonia Day – 12th NOVEMBER: World Pneumonia Day (12 November) provides an annual forum for the world to stand together and demand action in the fight against pneumonia. Pneumonia is a preventable and treatable disease that sickens 155 million children under 5 and kills 1.6 million each year. This makes pneumonia the number 1 killer of children under 5, claiming more lives in this age group than AIDS, malaria, and measles combined. World Pneumonia Day helps to bring this health crisis to the public's attention and encourages policy makers and grassroots organizers alike to combat the disease.

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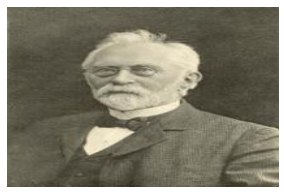
BIRTH DATES OF FAMOUS SCIENTIST IN THIS MONTH:



- NOVEMBER 03, 1841 **Johannes Eugenius Bülow Warming** **Famous as:** Danish botanist
  Eugen Warming, was a Danish botanist and a main founding figure of the scientific discipline of ecology. Warming wrote the first textbook (1895) on plant ecology, taught the first university course in ecology and gave the concept its meaning and content.
- NOVEMBER 05, 1892 **J.B.S. Haldane** **Famous as:** Geneticists, Biologists
  J.B.S. Haldane was a British-born Indian scientist and geneticist who made remarkable contribution in the field of population genetics and evolution. In 1923, he predicted the exhaustion of coal for power generation in Britain and proposed a network of hydrogen-generating windmills; the first of its kind in renewable energy.
- NOVEMBER 09, 1952 **Jack W. Szostak** **Famous as:** Biologist, Molecular biologist, Geneticist, Physician, Professor
  Nobel Prize-winning Canadian-American biochemist and geneticist Jack W. Szostak revolutionized medical science with his research on the manipulation of genes. The Cornell alumnus is credited with creating the first yeast artificial chromosome. He has also taught at the Harvard Medical School. In spite of being Polish, he doesn't speak the language.

- NOVEMBER 17, 1878 **Hans Zinsser** **Famous as:** Physician, Bacteriologist
  Zinsser's scientific work focused on bacteriology and immunology and he is most associated with typhus, especially the form called Brill–Zinsser disease, his namesake. He isolated the typhus bacterium and developed a protective vaccine. He wrote several books about biology and bacteria, notably *Rats, Lice and History* (1935), a "biography" of typhus fever.

- NOVEMBER 25, 1928 **Harry Martin Meyer, Jr.** **Famous as:** Virologist
  Dr. Harry Martin Meyer Jr., a pediatric virologist who played a vital role in defeating German measles and other infectious diseases. Working rapidly, they introduced the first rubella vaccine in 1966, assuring safe and lasting immunity at low cost.

INVENTIONS OF THE MONTH:

- NOVEMBER 13, 1979 Robert Jarvik was granted a patent for an artificial heart.
- NOVEMBER 25, 1975 Robert S. Ledley was granted patent for "diagnostic X-ray systems" known as the CAT-Scan.

BRANCH OF MICROBIOLOGY:

Space Microbiology (exobiology): It is the study of possible occurrence of microorganisms in the outer space and on planets (extra-terrestrial life), or the establishment of earth types of planets through space vehicle. It also includes the study of the potential use of microorganisms for food and energy and for maintenance of a suitable oxygen-carbon dioxide balance in the space vehicle, e.g., use of species of Chlorella.

Aims and Scope: This review covers the primary aspects of space microbiology that have been studied to date. Emphasis is placed on recent findings that have not yet been dealt with in a critical review, especially those that are of relevance to future space exploration programs. The fields covered include-

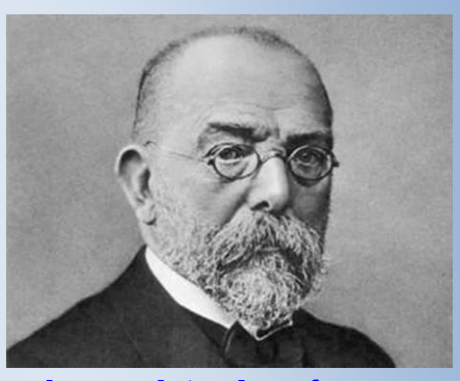
- The use of the space environment for understanding basic biological mechanisms, such as the role of gravity at the cellular, subcellular, and extracellular levels, biological effects of the radiation field in space, survival factors in the upper boundary of Earth's biosphere, and the likelihood of interplanetary transport of microorganisms via meteorites.
- Application-oriented aspects, such as the use of microorganisms in bioregenerative life support systems, the monitoring, characterization, and control of spacecraft microflora, and associated microbial crew health concerns.

ENVIRONMENTAL DAYS OF THE MONTH:

- International Day for Preventing the Exploitation of the Environment in War and Armed Conflict - 06 NOVEMBER
- World Fisheries Day - 21 NOVEMBER
- Buy Nothing Day - Last Friday of NOVEMBER
- Lead Poisoning Prevention Week - NOVEMBER

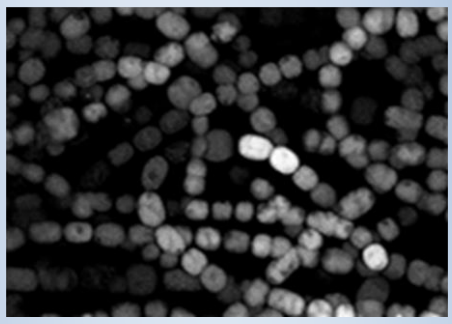
Research is to see what everybody else has seen, and to think what nobody else has thought.

-Albert Szent-Gyorgyi



***Robert Koch* (Father of Practical Bacteriology)**

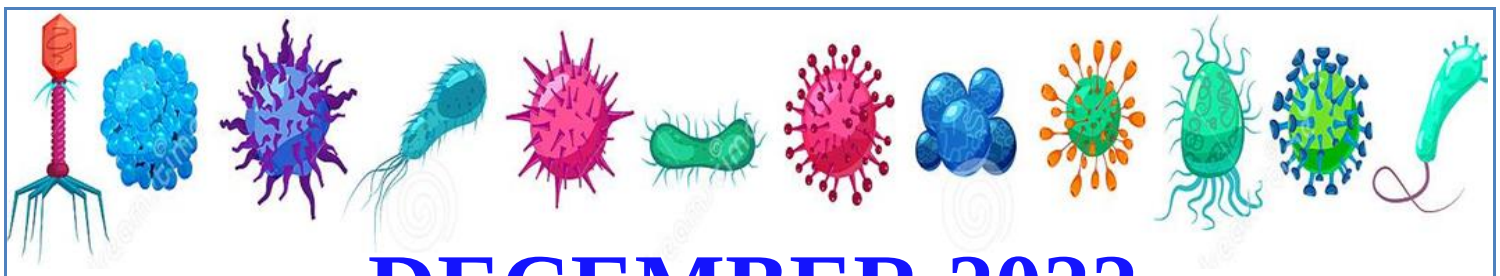
***Louis Pasteur* (Father of Modern Microbiology OR Father of Germ Theory)**



Pearl strands of fluorescing anabaena

Kingdom: Eubacterium
Scientific Name: *Anabaena*

These beautiful strands are not pearls, but rather bacteria that provide us with an element even more valuable to our survival than pearls - namely nitrogen. *Anabaena* fixes nitrogen; it takes nitrogen gas from the air and binds it into protein molecules. Certain species of bacteria are the only organisms on Earth that are able to fix nitrogen. Since all living things require proteins to function, and since all protein molecules include nitrogen atoms, nitrogen-fixing bacteria play a major role in supporting life on Earth. These bacteria grow in rice paddies on the underside of Azolla ferns. The nitrogen they fix provides an important source of fertilizer for rice. *Anabaena* is a multi-talented organism; it is also able to create sugar that it uses for food via photosynthesis, just as plants do.



DECEMBER 2022

M	T	W	T	F	S	S
			1 World AIDS Day	**2** National Pollution Prevention Day	**3**	**4** Alfred Day Hershey
5 World Soil Day International Volunteer Day	**6**	**7**	**8**	**9**	**10** Human Right Day	**11** Robert Koch Emmanuelle Marie Charpentier
12	**13**	**14** National Energy Conservation Day	**15**	**16** Hans Buchner	**17** Pierre Paul Émile Roux	**18** Harold E. Varmus
19	**20**	**21**	**22** Jean-Marie Camille Guérin	**23**	**24**	**25**
26	**27** Louis Pasteur	**28**	**29** International Day for Biological Diversity	**30**	**31**	

World AIDS Day – 1st DECEMBER: World AIDS Day, designated on 1 December every year since 1988, is an international day dedicated to raising awareness of the AIDS pandemic caused by the spread of HIV infection and mourning those who have died of the disease. The acquired immunodeficiency syndrome (AIDS) is a life-threatening condition caused by the human immunodeficiency virus (HIV). The HIV virus attacks the immune system of the patient and reduces its resistance to other diseases. Government and health officials, non-governmental organizations, and individuals around the world observe the day, often with education on AIDS prevention and control. World AIDS Day is one of the eleven official global public health campaigns marked by the World Health Organization (WHO).

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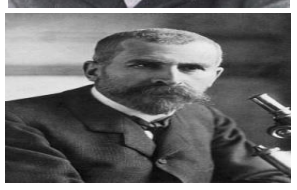
BIRTH DATES OF FAMOUS SCIENTIST IN THIS MONTH:

- DECEMBER 04, 1908 **Alfred Day Hershey** **Famous as:** Geneticists, Bacteriologists
  He is best known for the phenomenal 'blender experiment' he conducted with his colleague, Martha Chase, in 1952, which concluded that deoxyribonucleic acid (DNA), not its associated protein, is the genetic material of life. It derived the fact that DNA is the blue print of every existing lifeform on the planet which laid the groundwork for modern molecular genetics.
- DECEMBER 11, 1843 **Robert Koch** **Famous as:** Microbiologist, Physician
  Robert Koch was a German microbiologist and physician. One of the prominent co-founders of modern bacteriology, Koch is credited with creating and improving laboratory techniques and technologies in the field of microbiology. He is also credited with making important discoveries in public health. In 1905, Robert Koch won the *Nobel Prize in Physiology or Medicine* for his research on tuberculosis.

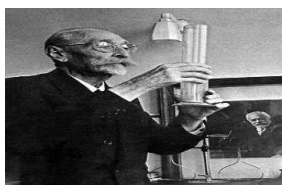
- DECEMBER 11, 1968 **Emmanuelle Marie Charpentier** **Famous as:** Researcher
  She is a French professor and researcher in microbiology, genetics, and biochemistry. In 2020, Charpentier and American biochemist Jennifer Doudna of the University of California, Berkeley, were awarded the Nobel Prize in Chemistry "for the development of a method for genome editing" (through CRISPR). This was the first science Nobel ever won by two women alone.

- DECEMBER 16, 1850 **Hans Buchner** **Famous as:** Bacteriologist
  Hans Buchner was a pioneer in the field of immunology. He was the first to discover a substance in blood serum that was capable of destroying bacteria. He called the substance "alexin", which was later named "complement" by Paul Ehrlich



- DECEMBER 17, 1853 **Pierre Paul Émile Roux** **Famous as:** Physician, Bacteriologist, Immunologist
  Roux was one of the closest collaborators of Louis Pasteur (1822–1895), a co-founder of the Pasteur Institute, and responsible for the institute's production of the anti-diphtheria serum, the first effective therapy for this disease. Additionally, he investigated cholera, chicken-cholera, rabies, and tuberculosis. Roux is regarded as a founder of the field of immunology.

- DECEMBER 18, 1939 **Harold E. Varmus** **Famous as:** Physician, Immunologist, Geneticists
  Harold E. Varmus, in collaboration with J. Michael Bishop performed pioneering cancer research and is credited with the discovery of the cellular origin of retroviral oncogenes. Their studies in cancer-causing genes (oncogenes) carried by retroviruses shed new light on several questions on cancers that had been puzzling scientists so far.



- DECEMBER 22, 1872 **Jean-Marie Camille Guérin** **Famous as:**
  Veterinarian, Bacteriologist and Immunologist
  Jean-Marie Camille Guérin together with Albert Calmette, developed the Bacillus Calmette-Guérin (BCG), a vaccine for immunization against tuberculosis.
- DECEMBER 27,1822 **Louis Pasteur** **Famous as:** Chemist and Microbiologist
  Considered one of the founders of bacteriology, Louis Pasteur created vaccines for anthrax and rabies, and invented the process of heating food and wine to kill microbes that cause contamination, which was named pasteurization after him. Known as the "father of microbiology," he also founded the **Pasteur Institute** in Paris.

INVENTIONS OF THE MONTH:

- DECEMBER 13, 1984 - Artificial heart recipient William Schroeder suffered his first stroke.

BRANCH OF MICROBIOLOGY:

Medical Microbiology: This branch deals with the pathogenic microbes—their life-cycle, physiology, genetics, reproduction, etc., Many of the microbes also provide remedies for microbial diseases. All these aspects are studied in this branch. Some of the diseases like tuberculosis, leprosy, typhoid, etc. are caused by microbes, and cure for them is provided by other microbes in the form of antibiotics.

Aims and Scope: Medical microbiology includes studies of bacteria, viruses, and parasites, all of which can be seen as the cause, and often part of the cure, for various diseases. Those with an undergraduate degree can work as research technicians in the private sector, nonprofit organizations, and academia. An advanced degree could translate to a career as a college educator or contributing member of a scientific team, which eventually could result in a leadership or management position, such as the director of an immunology or clinical microbiology laboratory. Employers include:

- Government agencies, such as the Center for Disease Control and the National Institutes of Health.
- Private health care services and philanthropic organizations, such as the American Cancer Society, the Muscular Dystrophy Association, and the American Heart Association.
- Pharmaceutical companies.
- Medical schools and university-affiliated teaching hospitals.
- Veterinary hospitals.

Upward mobility in this profession requires not only scientific skills, but also good communication, business, and management techniques. With advanced education and experience, medical microbiologists can develop and manage their own research projects.

ENVIRONMENTAL DAYS OF THE MONTH:

- National Pollution Prevention Day - 02 DECEMBER
- World Soil Day - 05 DECEMBER
- National Energy Conservation Day - 14 DECEMBER
- International Day for Biological Diversity - 29 DECEMBER