CVM UNIVERSITY

NATUBHAI. V. PATEL COLLEGE OF PURE AND APPLIED SCIENCES

SPECTRUM

June 2020 - October 2020

The measure of progress

From The Chief Editor's Desk
By: **Dr. Basudeb Bakshi**

Dear Readers,

'Spectrum—The measure of progress' has stirred the young and candid minds of enthusiastic writers. Present issue of spectrum could witness the vicissitudes associated with Covid-19. Deserted classrooms and labs transforming to online teaching, cybernetic labs and so on to manage with the difficult situation. However, nothing could put down the creative zeal of students which is evident through yet another collection of various thought provoking articles.

An optimistic attitude was observed in the students' perspective towards creative writing as many new talented writers showed up with their fascinating write ups. I personally feel that 'Spectrum' has touched and inspired the students to present and share their thoughts.

I would like to acknowledge the diligent work of the Editorial Team, who have worked hard to present a resplendent range of young writing.

I wish Best of luck to all the aspiring students for their University exams.

'Stay safe- stay blessed'

SARS CoV2 (COVID -19)

By:Dr.Anjali Kulkarni
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The world has experienced several epidemics causing serious threats to public health globally for example, acute respiratory syndrome (SARS) in 2002, the H1N1 pandemic in 2009, the Middle East respiratory syndrome (MERS) epidemic in 2012, the Ebola outbreak in 2014 and the current corona virus disease (COVID-19) pandemic since November 2019 till date.The COVID-19 was officially declared as a pandemic by the WHO on 11th March 2020 and has spread to more than 114 countries . Also, due to the fact that no one has immunity to COVID-19, it means thousands to millions of people are likely to be more susceptible to viral infection and severe disease.

It can be transmitted from human-to-human by respiratory droplets from sneezing, coughing, and aerosols, with symptomatic people being the major source of transmission. It has a dynamic incubation period of about 7 to 14 days.

Diagnosis of COVID-19: Laboratory diagnoses require the collection of respiratory specimens including oropharyngeal or nasopharyngeal aspirates or washes, oropharyngeal or nasopharyngeal swabs, sputum, bronchoalveolar lavage and tracheal aspirates , usually examined and tested with the cultural method of viral isolation in tissue culture or cell lines, the serological technique of antibody titre measurement, electron microscopy for examination of viral particles, conventional and real-time reverse transcriptase polymerase chain reaction.

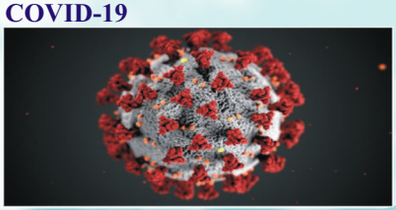
Control methods- Aggressive preventive methods following the WHO's strategy: interrupt transmission from animals to humans and human-to-human including reduction of secondary infections among health care workers and other close contacts, preventing transmission by continuous surveillance, isolation and prompt care for patientsAccording to the WHO, countries must detect, test, treat, isolate, trace every contact, and mobilize their citizens in the response.

- Those countries with a handful number of cases must prevent them from becoming clusters, and those clusters from becoming community transmission.
- Apply the principles of the 5Ps: prevention, preparedness, public health, political leadership, and the people awareness.
- Deliberate design of strategies for protecting the infected environment including "social distancing methods"of suspending schools and recommending telework to prevent infected people from spreading the disease to their classmates.
- Common preventive measures must be strictly followed, including good respiratory hygiene, hand washing, reduced or no movement into and out of infected areas except for necessity.
- SARS-CoV-2 viruses can be inactivated with 70% concentration of isopropanol and ethanol, use of alcohol based sanitizers for hand sanitization, apart from 0.1% sodium hypochlorite within 1 min exposure

Risk factors for COVID-19 disease progression: Category I – Age equal or over 65 , preexisting pulmonary diseases, chronic kidney diseases ,Diabetes ,history of cardiovascular diseases and hyper tension ,obesity, history of transplant .**Viral signs Category II** – Respiratory rate more than 24/min, Heart rate 125/min, oxygen saturation less than 95% .**Lab Category III**- CPK(**Creatine phosphokinase**) more than twice the upper limit of normal, Elevated troponn, Ferritin > 500 microgram /l (Times of India, Oct 27,2020).

As there is no vaccine available till date applying the principles of the 5Ps: prevention, preparedness, public health, political leadership, and the people awareness is the only key to manage COVID-19 pandemic.

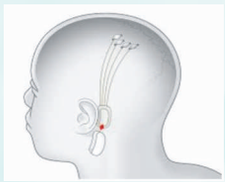
Disclaimer – This article is a compilation of information from various sources available on web on COVID-19



NEUROLINK TECHNOLOGY

By: Abhishek Rajpura
TYBCA

If you are interested in any type of technological upgradation then you must have heard the name of Elon Musk. He is the founder of Pay Pal, one of the most succaessful auto driven car company Tesla, a private space aviation organisation spacex and one of the the most richest man on this planet. It is estimated that he will be the first trillionaire of generations. So, this man invented a new company called neurolink. Neurolink corporation is an American neuro technological company developing implantable brain machine interfaces.



Neurolink is a technology that makes devices which are fitted inside the brain through a small advanced and critical surgery. This technology is comprised into a small chip which can not even be seen by naked eyes. Their main goal is to make a brain interpret and manipulate in real time basis through those small micro computer chips and create a network of thousands of ultra thin electrode wires.

Initially in nearly 5 to 10 years we will be only able to control our cell phones through our brain but at a larger prospect we would also be able to communicate through this chips and to the astonishing fact that we would not have to use our speaking ability to talk or communicate. This will make communication lightning-fast.

Not only communication but it is envisioned to cure almost any brain disease, traumatization, depression, blidness, seizures etc and it is purposely said to make us more smarter than robots.

One of the biggest brain in the world Stephen Hawking's said that"AI is likely to be either the best or the worst thing that will happen to humanity". This makes us question about the neurolink technology as we already know each coin has two sides and therefore it also has some disadvantages of its own. Many brain scientists believe that inserting any type of technology could harm your brain to a different level of extent. Also so the surgery to insert the chip can damage the small cells around the brain which are mainly used in the nervous system. Moreover in the future it would be very of obnoxious to even know that if somebody can read your thoughts, predict your actions and judge your outcomes and behaviour. In the world full of hackers you can never trust a small chip that goes into your brain and that it will not change your belief, mindset, behaviour and intelligence.

In August 2020 a small experiment done by Musk showed that your thoughts can be transferred from one user to another and touched on the idea of consensual telepathy but as obviously not everybody has access to your thoughts.

Whereas this technology has also its good side, for example imagine what ever you have read till date you can remember that word to word, story to story with at most accuracy. You can record each of your memory you had when you were two years of age. You can simultaneously watch the video of what you did when you were in the 7th grade or any other age.

One of the biggest challenges that neurolink must overcome is to develop materials that are safe to insert inside of a brain without causing infections or deteriorating. These tiny chips would need to read data quickly and decipher the high resolutions. Also it has been estimated that this would cost a few thousand dollars at a very initial stage but obviously it would be reduced for a lay man gradually with a period of time and help of lasers in surgeries.

Concluding this small research paragraph, if accurately created and with proper legal resolutions this technology has the power to change the world, it has power to change mankind. It has power to change the generations of generation.

BIODEGRADABLE- LEATHER PRODUCED USING FUNGI

By: **Sanjana Sane**
TYBSc Biotechnology

Leather is a durable and flexible material created by tanning animal raw hide and skins. The most common raw material is cattle hide. It can be produced at manufacturing scales ranging from artisan to modern industrial scale. It is used to make a variety of articles, including footwear, automobile seats, clothing, bags, book bindings, fashion accessories, and furniture. It is produced in a wide variety of types and styles and decorated by a wide range of techniques. There is also synthetic leather produced using substances of plastics like polyvinyl chloride (PVC) or polyurethane (PU) derived from fossil fuel.

But its use tends to have a lot of demerits like have some ethical issues and it is not environment friendly. So this is the alternative leather which is biodegradable which is produced using fungi. This research is carried out in University of Vienna. Leather substitutes can be produced from fungi by upcycling low-cost agricultural and forestry by-products (e.g. sawdust). These serve as a raw material for the growth of fungal mycelium, which constitutes a mass of elongated tubular structures and represents the vegetative growth of filamentous fungi. Within a couple of weeks, the fungal biomass can be harvested and physically and chemically treated (e.g. pressing, cross-linking). "As a result, these sheets of fungal biomass look like leather and exhibit comparable material and tactile properties," says department head Alexander Bismarck.

Leather substitute materials derived from fungi typically contain completely biodegradable chitin (which acts as a stabiliser in the material) and other polysaccharides such as glucans. The scientists investigate the feasibility of bovine and synthetic leathers. According to authors, the most challenging thing is the production of fungi-derived leather- like materials is still to attain uniform growth and constant thickness, colour and mechanical properties.

Main aim to produce this material is to provide possible alternative to bovine and synthetic leather which is cost-effective, socially accepted and environmental friendly and are of particular interest to sustainability-conscious consumers and companies as well as to the vegan community. Increasing awareness among people for leather industry's effects aon the environment and on animals, the market for cruelty-free alternatives keeps growing. Over the past few years, scientist have explored many ways to make vegan leather out of everything from pineapples to cactus leaves to flowers. Vegan leather has a lower impact than animal-based leather as it not only **leave animals out of the equation**, but the process of harvesting (aka breeding, raising, and killing animals) and tanning leather has a high environmental impact.

FAILURE: A LADDER TO SUCCESS

By: **Jigar Parmar**
SYBSc (IC)

Failure...this word seems to be small but makes a big difference in one's life. Most Importantly how an individual faces it is the question.

Sometimes the failure may be large, sometimes it may be small.We should always take failure positively. I know it's hard, but one should always try to come out from the failure, but essentially one should learn from failure. If " success is the peak of the mountain, then failure is the ladder to the peak of the mountain". It means that each and every successful individual today has gone through the ladder of failure-may be small. But failure always teaches a lesson. One gets depressed, it's my advice that, after getting failure you cry, you cry till you want to , but the next minute get up and just list down what are the reason for your failure. You study them, you should work on then. You work hard and you will make it happen.

My friends, it may happen to someone, that he/she is very close to the aim, goal and again by a very small margin you fail that is the most challenging time of your life. what to do is in your hands- Quit or again get up, work hard and make it happen. I know, it's hard to do this but it makes a very Big difference in your life and most importantly in your personality. You go from mentor motivation to self motivation zone and that's what is important. Believe me, when you are tired, exhausted and your inner voice says " Get up, you can do it" you can succeed in your life. There is a popular saying “If you think you can, You can. Because, you think you can.”

BACTERIA THAT SURVIVED IN SPACE

By: **Vivek Giri**
SYBSc Microbiology

According to an article published in August 26,2020 in the journal Frontiers in microbiology ,Akihiko **Yamagishi** and his colleagues at the **Tokyo University of Pharmacy and Life Sciences in Japan** successfully experimented that Microbes strapped to the outside of the International Space Station can survive for at least three years, suggesting that life has the potential to survive a journey through space from Earth to Mars.

Deinococcus radiodurans bacteria are naturally very resistant to radiation, because of their extraordinary capacity to repair their DNA when it gets damaged. It can survive cold, dehydration, vacuum, and acid, and therefore, is known as a polyextremophile.

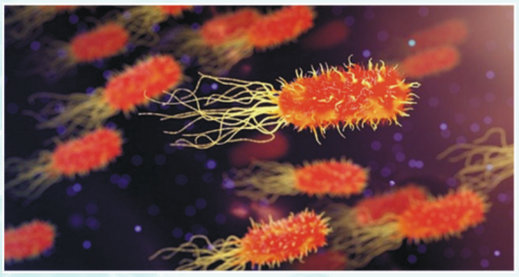
Yamagishi and his team sent Deinococcal cell clumps of various thicknesses to the **International Space Station,** where they were placed on aluminium plates and attached to the outside of the spacecraft for three years. Samples were taken each year and sent back to Earth for analysis.

Within the clumps that were at least half a millimetre thick, the researchers found surviving bacteria – even in the samples that were left outside the space station for three years. "Ultraviolet light in space is so strong and was expected to kill bacteria. We were surprised to see the surviving bacteria within the cell pellet for up to three years," says Yamagishi.

Although the bacteria in the outer layer of the clumps were destroyed by the UV, these dead cells seem to have shielded the bacteria in the innermost layers, which survived. These surviving bacteria were then able to repair their DNA from damage and could be grown in the laboratory.

Some interesting facts about *Deinococcus radiodurans*

- *Deinococcus radiodurans* was discovered in 1956 by Arthur W. Anderson at the Oregon Agricultural Experiment Station in Corvallis, Oregon.
- It was originally identified as a contaminant of irradiated canned meat in 1956.
- The world's toughest bacterium, in Guinness Book of World Records
- It can withstand up to five million rads of radiation! (3,000 times more than the dosage that could kill a human)
- As a consequence of its hardiness, it has been nicknamed "Conan the Bacterium" in reference to Conan the Barbarian.
- *Deinococcus radiodurans* in latin means "strange berry that withstands radiation."
- *Deinococcus radiodurans* is a gram positive bacteria.
- Colonies are smooth, convex, and pink to red in color.
- *Deinococcus radiodurans* does not form endospores and is nonmotile. It is an obligate aerobic chemoorganoheterotroph, i.e., it uses oxygen to derive energy from organic compounds in its environment.
- The bacteria are easily cultured and do not appear to cause disease.
- It can repair itself completely within 12-24 hours
- It can survive on Mars
- In 2003, U.S. scientists demonstrated *Deinococcus radiodurans* could be used as a means of information storage that might survive a nuclear catastrophe. They inserted the song "It's a Small World" into its DNA.
- It has even been found on the inside walls of nuclear reactors
- A nanotechnological application of *Deinococcus radiodurans* in the synthesis of silver and gold nanoparticles has also been described.



COVID 19 – PANDEMIC : AN ALARMING SITUATION

By: **Hetvi Ganatra**
SYBSc Biotechnology

The whole world has come to a standstill, and the reason is the pandemic COVID-19. All of a sudden, it seems we are a part of a horror movie. The villainous corona virus is killing thousands of people; it has turned our lives upside down. But along with worst come the best opportunities, and this time it had knocked the doors of science.

Biotechnologist, microbiologist started working on the mysterious virus, whose history was nonexistent, which seemed inevitable, and its rate of contagion and patterns of transmission threatened our sense of agency. So what is SARS-COV-2 commonly named as COVID-19? **SARS-CoV-2** (severe acute respiratory syndrome **coronavirus 2**) is a beta coronavirus enveloped with spikes, genetic material is positive-sense, single-stranded RNA viruses of zoonotic origin it was discovered in Wuhan city, China. According to the most of the researchers it's stated that the humans were infected by virus during consumption of bat soup. Virus has fleet-footed transmission, mainly by three modes,

1. Droplets transmission 2. Contact transmission
3. Aerosol transmission

After the transmission of the virus into human body it attacks lungs via ACE2 receptor to affect epithelial cells of the alveoli, and then Multiple SARS-CoV-2 proteins interact with components of the innate immune system to evade an antiviral interferon response. The Patients infected with COVID-19 show higher leukocyte numbers, abnormal respiratory findings, and increased levels of plasma pro-inflammatory cytokines. The main pathogenesis of COVID-19 infection as a respiratory system targeting virus is severe pneumonia, RNAaemia, combined with the incidence of acute cardiac injury. Knowledge of virus dynamics and host response are essential for formulating strategies for antiviral treatment, vaccination, and epidemiological control of covid 19. But firstly the detection of complex species i.e. SARS-CoV-2 RNA is carried out by reverse transcription polymerase chain reaction (RT-PCR), which is better using nasopharynx samples compared to throat samples. The Lower respiratory sample gives better yield than upper respiratory samples. Detection urges the need for cure and save the disinfect population; so many pharmacist, biochemist all over the world have tracked their genius minds on finding medicines and vaccines to eradicated the virus from humankinds.

"If I is replaced with we, even illness turns into wellness"All the researchers, scientist, doctors with the support of public are working with their blood, sweat and tear and in short time they find the headway. Although this communal virus has disturbed the dynamics of the world, it has given an enhancement to the field of science, importance of science has become worthy to notify.

ARE TOMATOES SAFE TO EAT?

By: Dixi Gandhi
TYBSc Biotechnology

The major causes of food borne disease are *Salmonella*, Shiga toxin-producing *E. coli* and *Listeria* monocytogenes, and such pathogens grow on surface of tomatoes during postharvest treatment. Thus, an alternative method was discovered which helped to improve quality of tomato and only 21% of *E. coli* outbreaks reported over a 20-year span. Initially combination of levulinic acid and sodium dodecyl sulphate as preharvest spray was approved by U.S drug and food administration. The principle behind this strategy was based on previous studies performed on romaine lettuce where combination of levulinic acid and sodium dodecyl sulfate substantially reduced both *Salmonella* and *E.coli* without adversely affecting lettuce quality. However chlorine-based disinfectants -- including chlorine gas, sodium hypochlorite, calcium hypochlorite and chlorine dioxide are mainly used to treat postharvest crops, the preharvest application of bactericides is not a common practice. Upon spraying this combination in tomato field, it reduced the growth of bacteria on surface of tomato and was also found to be environment friendly. To test effectiveness of combination in laboratory, the tomato plants were sprayed a solution containing five strains of *E.coli*, *Salmonella* and *Listeria* each, and then tomato plants were divided into three groups; first group was treated with acidified chlorine as the positive control, the second with a treatment solution containing levulinic acid and sodium dodecyl sulfate as the test group, and the third treated with tap water only as the negative control.

For the three plots used for farm application testing, the positive and negative control groups were treated the same way, and a commercial product -- Fit-L -- was diluted according to the manufacturer's description and used as the treatment solution. Before treatment studies on the farm, two concentrations of the treatment solution were tested for safety on tomato seedlings in the greenhouse.

Results obtained were quite promising, this combination proved to be an effective preservative as it reduced the population of bacteria on tomato surface and was also quite affordable. Preharvest treatment reduce pathogens thus saves labor costs for producers who need workers to perform postharvest washing and drying of produce before packaging.

THE ERA OF DATA: THE DATA SCIENCE GUIDE

By: **Heet Patel**
TYBSc (CA&IT)

In this technical world, we are largely shifted to using technology as our major part of life. From mobile applications to home appliances the advance computer programmes technology has served with many boons towards human development, Data Science is one of those.

Data science is a tool that turns data into real-world actions. There includes machine learning, statistics, programming, database technologies, and domain-specific technologies.

It's about collecting, analysing, communicating and modelling the data around us in a productive way.

Data Science includes Experimentation, analytics, business intelligence, etc. and most popular ones are Machine Learning and AI.

Machine learning and AI dominates because of the trends that all the new companies want to establish their base. But big companies like Google and Facebook are already so much established, they only want to improve their product and services. Being a data scientist is not about how much advance your model is but how much impact you are creating with your work.

This is the reason why so many companies are hiring Data scientists because with all the resources now available you can actually make a big change in the industry.

Where to start? Programming is the fundamental skill for being at any place in this Tech World. The most important question is in which language we should work on.

Now, so many people will argue that R is so much good at maths and stats. I wouldn't disagree but Python is way better and gives you more mileage in doing big data work in compare to R. With Python, you can do larger range of task like data wrangling and setting up web services. Another reason I would suggest Python is that it is so much easy to learn and implement. You can automate a lot of tasks and do some cool things with it.

Get yourself familiar with **Numpy, OpenCV, Pandas & Matplotlib**. Learn how to use, manipulate, and visualize data. The only way you will learn these libraries is by using them. Don't feel like you have to memorize every method or function name, that comes with practice. If you forget, just Google it.

Quick Tip: Python is a pretty amazing language. You can do almost anything and everything from it. An advice is to not waste more time in exploring python, you only need to get familiar with its the syntax. Data science is more above that.

Mathematics: A mathematics is a key skill every Data scientist must have. You can't understand a bit of the problem if you don't have the required skill. Knowledge of Statistics, Probability & Linear Algebra is necessary for all of the machine learning and data analysis work. Focus especially hard on descriptive statistics. Being able to understand a data set is a skill worth its weight in gold.

Some of the useful links are:

https://www.mathsisfun.com/data

https://machinelearningmastery.com/gentle-introduction-linear-algebra

Machine Learning: Now that you have learned the basic math of Data science, you will now be able to understand various Machine Learning Algorithms in details. You need these algorithms to derive insights, classification, clustering of Data. These algorithms will help you to understand how a real-world problem can be solved and how the data can be analyzed and manipulated according to that. These algorithms are like weapons to tackle such massive problems with humongous data. Although there can be multiple approaches to solve a problem after working on some projects, you will have idea about which algorithm to use in which case.

After getting familiar with various Machine Learning Algorithms, you can move further to learn some Deep Learning Techniques. concerned with algorithms inspired by the structure and function of the brain called artificial neural networks. You'll find it more interesting as you'll go deeper into this.

Helpful links: Machine Learning with Andrew Ng; Machine Learning for Beginners

Database: With massive data currently available, businesses and industries are collecting and churning out billions of data every day. The big data phenomenon requires a proper skill set to be able to make meaning out of it. So database manipulation is a required skill set for any data scientist to work in the industry.

FIRST IMAGE OF THE BLACK HOLE.

By: **Prerak Patel**
SY BSc (Chemistry)

As we know, this gigantic and expanding universe is filled with enormous amount of beautiful and mysterious things. A lot already already solved, and others yet to be. One of them is black hole, a region of spacetime where gravity is so strong that nothing—no particles or even electromagnetic radiation such as light—can escape from it.

We as humans see things which can reflect light back to our eyes, we can hear sounds waves of 20 to 20K Hz which pass through our ears. And for the rest of frequency we've made several instruments. Instruments which can detect sound and electromagnetic waves passing through them.Through this instrument we can create optical representations (aka photo) of what we can see through our eyes.

So the question arised, how do we optically represent something which leaves no electromagnetic waves behind to be detected and captured . And thus there was no possible way to capture the photo of black hole, until the breakthrough of modified Event Horizon Telescope(EHT) By Sheperd Doeleman. EHT works by creating an array of smaller telescopes that can be synchronized to focus on the same object at the same time and act as a giant virtual telescope. Using this telescope a team called Event Horizon Telescope Collaboration of 347 scientists and astrophysicist who worked from 20 different countries successfully captured supermassive black hole at the center of M87, a galaxy 54 million light years away on the date of 10th april 2020. The EHT team worked for more than 10 years to capture the image by combining the data of eight different EHT telescopes located all around the world. Imaging algorithms were then used to piece together the photo.

This achievement was not only important because we could see the black hole but by this we were able to predict the precise mass of M87 by measuring the radius of M87's event horizon, or its Schwarzschild radius. Moreover, Einstein's General relativity predicts that this silhouette(dark shape and outline of black hole) would be roughly circular, but other theories of gravity predict. This picture of M87 showed a circular silhouette, thus again proving Einstein's general relativity.

MATHS AROUND US

By: **Lakshay jain**
S.Y (Maths)

When I passed out my 10th, the world most difficult problem is to choose the right stream. (i.e. math , bio, commerce, computer etc. A student who want to choose Mathematics, make funs of them that what is the particle use of Mathematics, other subjects like Physics , chemistry and so on) then how to answer this difficult question. We all use math in everyday life whether we're aware of it or not. If you look hard enough, you'll see math emerge from some of the most unlikely places.

Mathematics is the universal language of our environment, helping mankind explain and create. From playing games to playing music, math is vital to helping students fine tune their creativity and turn their dreams into reality.

So I tell you how Mathematics is related to us:-

People use math knowledge when cooking. For example, it is very common to use a half or double of a recipe. In this case, people use proportions and ratios to make correct calculations for each ingredient. If a recipe calls for 2/3 of a cup of flour, the cook has to calculate how much half is or double of 2/3 of a cup. Then the cook has to represent the amount using standard measures used in baking, such as ¼ cup, 1/3 cup, ½ cup or 1 cup

Speed, Time, and Distance' all these three things are studied in mathematical subjects, which are the basics of driving irrespective of any mode of transportation.Trigonometry is used to in measuring the height of a building or a mountain. The distance of a building from the viewpoint and the elevation angle can easily determine the height of a building using the trigonometric functions.

Trigonometry is even used in the investigation of a crime scene. The functions of trigonometry are helpful to calculate a trajectory of a projectile and to estimate the causes of a collision in a car accident. Further, it is used to identify how an object falls or in what angle the gun is shot.

Have you ever played the game, Mario? When you see him so smoothly glide over the road blocks. He doesn't really jump straight along the Y axis, it is a slightly curved path or a parabolic path that he takes to tackle the obstacles on his way. Trigonometry helps Mario jump over these obstacles. As you know Gaming industry is all about IT and computers and hence Trigonometry is of equal importance for these engineers.

Since you mentioned "real world".

The "real world" consists of miniscule particles: protons, electrons, etc. Which are not exactly particles: quantum mechanics says each of them looks like a wave. Normal waves have some "value" or "displacement" or "magnitude" in each point of space.

Magnitude (amplitude) of waves in quantum mechanics are complex! Just imagine, the whole "real world", everything you can see or touch consists of some waves with complex amplitudes!

Complex numbers are used in real world literally EVERYWHERE.