CVM UNIVERSITY

NATUBHAI. V. PATEL COLLEGE OF PURE AND APPLIED SCIENCES

SPECTRUM

June 2021 - November 2021

The measure of progress

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

Dear Readers,

I am extremely happy and privileged to proclaim that our college has completed its **TWENTY FIVE YEARS** of imparting quality education in the areas of pure & applied sciences. We are excited to celebrate **silver jubilee** of our college for which we have got back to our dynamism with all new hopes and hues under the strict guidelines of UGC for Covid-19. After a long period of observing deserted classrooms college has been recharged to its full swing with various curricular and extracurricular activities. I firmly believe that our success depends upon our internal power to perceive, to observe and to explore. I am thankful to my colleagues and students who poured their sincere efforts in sailing the present issue of Spectrum to the shore of its publication. I am sure that our e-magazine Spectrum will set a tradition to witness the expression of relentless progress of our budding brains. I wish GOOD LUCK to all my dear students for their forthcoming University examinations. May you all shine like stars and bring more laurels to the college.

'Happy Diwali to all of you'.

Photoluminescence, Phosphorescence and Fluorescence Spectroscopy

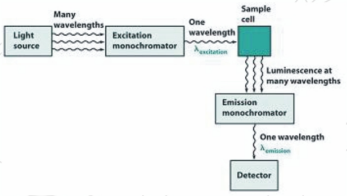
By: Dr. Mehul Dave
Assistant Professor
Physical Sciences

Photoluminescence spectroscopy is a contactless, nondestructive method of probing the electronic structure of materials. Light is directed onto a sample, where it is absorbed and imparts excess energy into the material in a process called ***photo-excitation.*** One way this excess energy can be dissipated by the sample is through the emission of light, or ***luminescence.*** In the case of photo-excitation, this luminescence is called ***photoluminescence.***Photo-excitation causes electrons within a material to move into permissible excited states. When these electrons return to their equilibrium states, the excess energy is released and may include the emission of light (a radiative process) or may not (a nonradiative process). The energy of the emitted light (photoluminescence) relates to the difference in energy levels between the two electron states involved in the transition between the excited state and the equilibrium state. The quantity of the emitted light is related to the relative contribution of the radiative process.

Forms of Photoluminescence

- Resonant Radiation: In resonant radiation, a photon of a particular wavelength is absorbed and an equivalent photon is immediately emitted, through which no significant internal energy transitions of the chemical substrate between absorption and emission are involved and the process is usually of an order of 10 nanoseconds.
- Fluorescence: When the chemical substrate undergoes internal energy transitions before relaxing to its ground state by emitting photons, some of the absorbed energy is dissipated so that the emitted light photons are of lower energy than those absorbed. One of such most familiar phenomenon is fluorescence, which has a short lifetime (10^{-8} to 10^{-4}s).
- Phosphorescence: Phosphorescence is a radiational transition, in which the absorbed energy undergoes intersystem crossing into a state with a different spin multiplicity. The lifetime of phosphorescence is usually from 10^{-4} -10^{-2} s, much longer than that of Fluorescence. Therefore, phosphorescence is even rarer than fluorescence, since a molecule in the triplet state has a good chance of undergoing intersystem crossing to ground state before phosphorescence can occur.

A schematic of an emission experiment is given in Figure. An excitation wavelength is selected by one monochromator, and luminescence is observed through a second monochromator, usually positioned at 90° to the incident light to minimize the intensity of scattered light reaching the detector. If the excitation wavelength is fixed and the emitted radiation is scanned, an emission spectrum is produced.



The sample is irradiated at one wavelength and emission is observed over a range of wavelengths. The excitation monochromator selects the excitation wavelength and the emission monochromator selects one wavelength at a time to observe.

Applications: Detection of ACQ (Aggregation-caused quenching) properties, Photoluminescence spectroscopy is of great significance in other fields of analysisespecially semiconductors, Band Gap Determination, Impurity Levels and Defect Detection, Recombination Mechanisms, Surface and Structure and Excited States

Limitations of Photoluminescence Spectroscopy : The main scientific limitation of photoluminescence is that many optical centers may have multiple excited states, which are not populated at low temperature.

Artificial Intelligence in Future

By: **Ankur Srivastav,**
M.Sc. CA&IT – 3rd Sem

Wisdom is a weapon to word of destruction. It is an inner fortress enemies cannot destroy. - **Thirukkural 421(200BC)**

Every day a large portion of population, is at the mercy of rising technology, yet few actually understood what it is. Artificial Intelligence, we know, HAL 9000 and Marvin the Paranoid Android? Thanks to books and movies, each generation has formed its own fantasy of a world ruled – or at teased served – by robots. From chess-playing computers to self-driving vehicles, artificial intelligence(AI) is progressing rapidly and touching every aspect of our lives. We have been conditioned to expect flying cars that steer clear of traffic and robotic maids whipping up our weekday dinner. But it the age of artificial intelligence is here, why don't our lives look more like the Jetsons? Well, if we ever browsed Netflix movie suggestions or told Alexa to order a pizza, we are probably interacting with Artificial Intelligence. AI is developing at whirlwind rates. While no body can say for certain how it will impact our work and personal lives. Also, with COVID-19 limiting human interaction in the built environment, advancements in AI and automation are on course to accelerate.

How Artificial Intelligence will change the future of work?--AI and Machine Learning are already changing the way we work and future will likely see some big changes. AI could also create more jobs and help us recruit candidates as long as people are willing to adopt and work smarter.

Future of AI in Industries--The AI market is predicted to grow exponentially. Analyzing whether AI is going to displace the work force or create more jobs are unavailable. This is task domain of AI. Most industries today hat need an AI system actually need a not anoverar ching system, but one that can preform a very specific task and do so incredibly well. For example- several companies have developed chat bots that outperform perform the research behemoth models like GPT-3 and BERT (Bidirectional Encoder Representation from Transformers).

The way we recruit will change--AI and Machine Learning are already change the way we recruit the employees. Technology enables us to analyze thousands of profiles and compile a list of relevant candidates efficiently. Following the short listing process, AI technology can be used to communicate with candidates and keep them engaged at every stage of the recruitment journeys. There are lots of AI recruitment tools out there today that help businesses hire remote workers. Once the right candidates have been chosen, AI enable chat bots can be used to facilitate the on boarding process, helping new starters understand everything from internal process to the company culture. When artificial intelligence teams up with the Internet of things, trend prediction can be done quickly, making businesses more efficient, sustainable and effective. In time it will also change the way companies are run, with humans collaborating with AI brains to solve complex problems(Yes there will still be a need for human input). There are tools available that use robotic process automation (RPA) to monitor work flows and make informed/ intelligent suggestions as to how tasks can be managed more effectively. Today and in the foreseeable future at least, AI in the context of work is all about complementing and maximizing human inputs as opposed to replacing it. It's about eliminating the mundane and freeing us up to focus on the creative things only humans can do.

Immunovirotherapy as a Potential Treatment for Young Oncolytic Brain

By: **Hetvi Ganatra**
B. Sc. BT - 5th Sem

"Glioma," as brief as it sounds, is much more serious. They account for about 8% to 10% of pediatric brain tumors and are more likely to impact children under the age of ten. They affect approximately 6.6 per 100,000 people each year, with 2.94 per 100,000 people under the age of 14. And it's not surprising that the average survival period is 12-18 months - only 25% of glioblastoma patients survive longer than a year, and only 5% survive more than five years. There was no alternative therapy until now, but according to the latest study, there is a glimmer of light in the area of ontological medicine.

High-grade gliomas in children are predominantly immunologically silent or "cold," with few tumor-infiltrating lymphocytes. Scientists developed oncolytic virotherapy using bioengineered herpes simplex virus type 1 (HSV-1) G207 after extensive brainstorming. This G207 virus was genetically modified, with the elimination of the diploid 134.5 neurovirulence gene and the inactivation of viral ribonucleotide reductase via insertion of Escherichia coli lacZ. These changes prevent productive infection in normal cells while allowing tumor cells to replicate.

Before all of this, accessing the brain is a complex thing, but the G207 virus could move through the blood-brain barrier which makes it more potent. G207 can reverse tumor immune suppression, increase cross-presentation of tumor antigens, and encourage an antitumor immune response in addition to infection and direct lysis of tumor cells. A single dose of radiation has been shown in animal models to improve G207 effectiveness by increasing virus replication and spread. According to the researchers, the study hypothesized that "intratumoral G207 would increase the amount of tumor-infiltrating lymphocytes and thus transform immunologically 'cold' pediatric brain tumors to 'hot' and 'inflamed.'

Since viruses are no one's companion, the treatment's aftereffects on the patient's brain were examined, and interestingly, G207 administration was not associated with any dose-limiting toxicity or severe adverse incidents. It didn't even showcase any viral shedding or viremia. The most common adverse effects of any grade reported by G207 medication were anemia, perirectal abscess, increased alanine transaminase, decreased lymphocyte count, decreased neutrophil count, decreased white blood cell count, and obesity. These side effects were manageable, which enhanced the chances of survival.

The median overall survival was 12.2 months, which was 120 percent better than the usual overall survival for advanced pediatric high-grade glioma, which was 5.6 months. Furthermore, the study of post-intervention tumor tissue demonstrated a significant increase in tumor-infiltrating immune cells, including CD4+ and CD8+ T cells, within two to nine months of G207 administration, implying that previous HSV-1 exposure could be a significant predictor of clinical outcomes.

In patients with recurrent or progressive pediatric high-grade glioma, intratumoral G207 alone or in combination with radiation had an adequate adverse-event profile with evidence of responses.

"Targeting pediatric high-grade glioma with oncolytic immune viro therapy utilizing a modified cold-sore virus is a safe and potentially effective approach."

Spectrum

By: **Rushik Barot**
B. Sc. GT - 5th Sem

Spectrum, in optics, the arrangement according to wavelength of visible, ultraviolet, and infrared light. An instrument designed for visual observation of spectra is called a spectroscope; an instrument that photographs or maps spectra is a spectrograph. Spectra may be classified according to the nature of their origin, *i.e.*, emission or absorption. An emission spectrum consists of all the radiations emitted by atoms or molecules, whereas in an absorption spectrum, portions of a continuous spectrum (light containing all wavelengths) are missing because they have been absorbed by the medium through which the light has passed; the missing wavelengths appear as dark lines or gaps. The spectrum of incandescent solids is said to be continuous because all wavelengths are present. The spectrum of incandescent gases, on the other hand, is called a line spectrum because only a few wavelengths are emitted. These wavelengths appear to be a series of parallel lines because a slit is used as the light-imaging device. Line spectra are characteristic of the elements that emit the radiation. Line spectra are also called atomic spectra because the lines represent wavelengths radiated from atoms when electrons change from one energy level to another. Band spectra is the name given to groups of lines so closely spaced that each group appears to be a band, *e.g.*, nitrogen spectrum. Band spectra, or molecular spectra, are produced by molecules radiating their rotational or vibrational energies, or both simultaneously

HISTORY OF ORGANIC CHEMISTRY

By: **Avani Naghera**
B. Sc. Chemistry - 5th Sem

The history of organic chemistry can be traced back to ancient times when men extracted chemicals from plants and animals to treat members of their tribes. They didn't label their work as "organic chemistry", they simply kept records of the useful properties and uses of things like willow bark which was used as a pain killer. (It is now known that willow bark contains acetylsalicylic acid, the ingredient in aspirin - chewing on the bark extracted the aspirin.) Their knowledge formed the basis of modern pharmacology which has a strong dependence on knowledge of organic chemistry. Organic chemistry was first defined as a branch of modern science in the early 1800's by Jon Jacob Berzelius. He classified chemical compounds into two main groups: organic if they originated in living or once-living matter and inorganic if they came from "mineral" or non-living matter. Like most chemists of his era, Berzelius believed in Vitalism - the idea that organic compounds could only originate from living organisms through the action of some vital force.

It was a student of Berzelius' who made the discovery that would result in the abandonment of Vitalism as a scientific theory. In 1828, Frederich Wöhler discovered that urea - an organic compound - could be made by heating ammonium cyanate (an inorganic compound).

Wöhler's discovery was a turning point in science history for two reasons. First, it undermined the idea of Vitalism because an organic compound was produced from an inorganic one. However, it also represented the discovery of isomerism - the possibility of two or more different structures (ammonium cyanate crystals and urea crystals) based on the same chemical formula (N2H4CO). Chemists started searching for reasons to explain isomerism. That in turn led to theories about the structure of chemical compounds. By the 1860's, chemists like Kékulé were proposing theories on the relationship between a compound's chemical formula and the physical distribution of its atoms. By the 1900's chemists were trying to determine the nature of chemical bonding by developing models for electron distribution. During all of this time the number of known organic compounds was increasing rapidly year by year. During the 20th century, organic chemistry branched into sub-disciplines such as polymer chemistry, pharmacology, bioengineering, petro-chemistry, and numerous others. During that century, millions of new substances were discovered or synthesized. Today over 98% of all known compounds are organic.

Scope of Python - A Based Approach

By: **Arsh Pathak**
B.Sc. CA&IT – 5th Sem

In the world of fast development, the requirement for it to be aided by even faster technology is created. Computers are the future and there is no denying that but how exactly can we communicate with something which only understands the language of ones and zeros?That's where the need of coding language arises from. Since the old times we have been using C++ as a coding language to comply with creation of powerful search engines, VR applications, air travel and what not.!

So…Why move on to any other coding language? Well, the answer is simple. Just like with any product there is always some room for improvement. "Python" the comparatively newer coding language is much more easy-to-read, understand and implement. Moreover, its used for data analysis and machine learning (in simple terms Artificial Intelligence) based programming.Scan and find the real article in detail along with pictures here:

What's Discord? It's a social platform providing free services of instant messaging, voice or video calling along with media and files sharing with others over personal or public methods in-app over the internet. Its commonly utilized by the gaming community to mix the communication and gaming experience into together.

Check out "https://discord.com" for more details.

One application of python over discord is bots, we first need to understand what exactly is a bot?Bots are just like other users you may find on discord except, they aren't actual person or people and are coded to react a certain way to a certain event(s) triggered by the person using/commanding the bot. Mostly this is achieved by the use of "prefixes" i.e., some term to add before the actual command.

We have covered the case of use provided by python compared to any other language and also have learnt to create a basic greeting bot which replies to us whenever we say Hello to it in the real article (Scan and read).The possibilities to go from here on is endless, you may try to check some other verified bots which are available on discord to see the depth of the sea out there. Common examples would be Dank memer bot created by Mr. Melmsic or Mc &You bot being developed by Mr. Spirin.

So, when are you starting your journey with python?

ZOLGENSMA- A Life - Saving Injection of Rs 16 Cr!! (The Most Expensive Medical Drug in World Now).

By: **Shakshi H. Desai**
B. Sc. (Hons.) Genetics - 3rd Sem

Zolgensma (onasemnogene abeparvovec-xioi) is a gene replacement therapy indicated for the treatment of spinal muscular atrophy (SMA) in paediatric patients.**Spinal muscular atrophy (SMA)** is a genetic disease affecting the central nervous system, peripheral nervous system, and voluntary muscle movement (skeletal muscle). SMA involves the loss of nerve cells called motor neurons in the spinal cord and is classified as a motor neuron disease.

S=Spinalas most of the nerve cells that control muscles are located in the spinal cord. **M=Muscular**because its primary effect is on muscles, which don't receive signals from these nerve cells. **A=Atrophy** generally refers for getting smaller, which is what generally happens to muscles when they're not stimulated by nerve cells.

SMA is a severe, progressive rare neuromuscular disease that can be fatal. It affects around one in 10,000 live births globally and one in 7,744 live births in India. A person with SMA inherits two copies of a missing or faulty (mutated) survival motor neuron 1 (SMN1) gene. One faulty gene comes from the mother and the other comes from the father. An adult can have a single copy of the defective gene that causes SMA and not know it.There are four primary types of SMA:

Type 0(most severe): Type 0 affects a baby while still in the womb, evidenced by reduced fetal movements in the later stages of pregnancy. At birth, infants with this SMA type typically present with severe weakness, extremely weak muscle tone (lack of tension in the muscles, which can cause floppiness), as well as respiratory failure.

Type 1 (severe): About 60% of people with SMA have type 1, also called Werdnig-Hoffman disease. Symptoms appear at birth or within an infant's first six months of life. Infants with type 1 SMA have difficulty swallowing and sucking. They don't meet typical milestones like holding up their heads or sitting. As muscles continue to weaken, children become more prone to respiratory infections and collapsed lungs (pneumothorax). Most children with type 1 SMA die before their second birthday.

Type 2 (intermediate): Symptoms of type 2 SMA (also called Dubowitz disease) appear when a child is between six months and 18 months old. This type tends to affect the lower limbs. Children with type 2 SMA may be able to sit up but can't walk. Most children with type 2 SMA live into adulthood.

Type 3 (mild): Symptoms of type 3 SMA (also called Kugelbert-Welander or juvenile-onset SMA) appear after a child's first 18 months of life. Some people with type 3 don't have signs of disease until early adulthood. Type 3 symptoms include mild muscle weakness, difficulty walking and frequent respiratory infections. Over time, symptoms can affect the ability to walk or stand. Type 3 SMA doesn't significantly shorten life expectancy.

Type 4 (adult): The rare adult form of SMA doesn't typically appear until the mid-30s. Muscle weakness symptoms progress slowly, so most people with type 4 remain mobile and live full lives.

Finkel type SMA: Finkel type SMA (FSMA) is an adult-onset form of the disease caused by mutations in the VAPB gene. It was first described by Dr. Richard Finkel in 1962.

SMARD 1(Distal SMA): Spinal muscular atrophy with respiratory distress type 1 (SMARD1) is an inherited condition that causes muscle weakness and respiratory failure typically beginning in infancy. Early features of this condition are difficult and noisy breathing, especially when inhaling; a weak cry; problems feeding; and recurrent episodes of pneumonia. Typically, between the ages of 6 weeks and 6 months, infants with this condition will experience a sudden inability to breathe due to paralysis of the muscle that separates the abdomen from the chest cavity (the diaphragm).

Cause---People with SMA are either missing part of the SMN1 gene or have a changed (mutated)

gene. A healthy SMN1 gene produces SMN protein. Motor neurons need this protein to survive and function properly.

People with SMA don't make enough SMN protein, and so the motor neurons shrink and die. As a result, the brain can't control voluntary movements, especially motion in the head, neck, arms and legs.

People also have SMN2 genes that produce a small amount of SMN protein. A person may have up to eight copies of an SMN2 gene. Having multiple copies of the SMN2 gene typically leads to less severe SMA symptoms because the extra genes make up for the missing SMN1 protein. Rarely, non-SMN gene mutations (non-chromosome 5) cause SMA.

Symptoms--SMA symptoms vary depending on the type. In general, people with SMA experience a progressive loss of muscle control, movement and strength. Muscle loss gets worse with age. The disease tends to severely affect the muscles closest to the torso and neck. Some people with SMA never walk, sit or stand. Others gradually lose their ability to do these actions.

Diagnosis---Some SMA symptoms resemble those resulting from neuromuscular disorders like muscular dystrophy. To find the cause of symptoms, following tests are done to diagnose SMA:

Blood test: An enzyme and protein blood test can check for high levels of creatine kinase. Deteriorating muscles release this enzyme into the bloodstream.

Genetic test: This blood test identifies problems with the SMN1 gene. As a diagnostic tool, a genetic test is 95% effective at finding the altered SMN1 gene. Some states test for SMA as part of routine newborn screenings.

Nerve conduction test: An electromyogram (EMG) measures the electrical activity of nerves muscles and nerves.

Muscle biopsy: Rarely, a physician may perform a muscle biopsy. This procedure involves removing a small amount of muscle tissue and sending it to a lab for examination. A biopsy can show atrophy, or loss of muscle.

Treatment--There isn't a cure for SMA. Treatments depend upon the type of SMA and symptoms. Many people with SMA benefit from physical and occupational therapy and assistive devices, such as orthopedic braces, crutches, walkers and wheelchairs.

These treatments may also help:

Disease-modifying therapy: These drugs stimulate production of SMN protein. Nusinersen (Spinraza®) is for children ages 2 to 12. Your provider injects the drug into the space around the spinal canal. A different medication, risdaplam (Evrysdi®), helps adults and children older than two months. People take risdaplam daily by mouth (orally).

Gene replacement therapy: Children younger than two may benefit from a one-time intravenous (IV) infusion of a drug called onasemnogene abeparvovec-xioi (Zolgensma®). This therapy replaces a missing or faulty SMN1 gene with a functioning gene.

Zolgensma is approved to treat spinal muscular atrophy (SMA)* in children less than 2 years old. The SMA must be caused by genetic changes in the SMN1 gene. This gene is in nerve cells and helps control muscle function.

Zolgensma (onasemnogene abeparvovec-xioi) treats the genetic root cause of SMA by replacing the missing or nonworking SMN1 gene with a new, working copy of a human SMN gene. It does this by using a vector, which is a "carrier" that can get the new, working SMN1 gene into the body. The vector in this case is a virus called AAV9 that has had its DNA removed and replaced with the SMN1 gene. This type of virus does not make you sick but can quickly travel through the body to the motor neuron cells and deliver the new gene.

Zolgensma sits inside the nucleus of the motor neuron cell and tells the motor neuron cell to start making new SMN1 protein. Once the genes reach their destination, the vectors are broken down and excreted from the body and do not become part of the child's DNA.

The reason Zolgensma is so expensive is because that is the price Novartis has decided it is worth because it "dramatically transforms the lives of families affected by this devastating disease" and the claimed cost of bringing new drugs to market. But this price is not without controversy.

Edge Computing

By: **Vaibhav M. Yadav**
B.Sc.- CA&IT – 5th Sem

Anything that's not a traditional data center could be the 'edge' to somebody. The advance of digitalization brings countless benefits to business and society but dealing with the higher volumes of generated data is arduous. Edge computing offers enormous advantages to manufacturers and is evolving technology of the future. Edge computing is a distributed computing paradigm that brings computation and data storage closer to sources of data. Nowadays, due to the explosion of the data approaching from the (IoT) devices, requisites huge and more expensive connections. The connection can be to a data center or the cloud. As we, know the Internet of things establishes a faster connection between Datacenter or cloud and the devices, generates a large amount of data handling, or managing this data with traditional methods is complicated. Edge computing is a term that operates world-increasing data that is about 175 zettabytes till 2025. From a simplified view, Edge computing refers to a device that acts, edge of your running device to provide better and faster results using cloud technologies. Edge computing aims to move the computation away from data centers towards the edge of the network, exploiting smart objects, mobile phones, or network gateways to perform tasks and provide services on behalf of the cloud. It is already in use all around us, the wearable on our wrist to the computer passing intersection traffic flow. So, the upside of edge computing is the faster response time for an application that requires it and slowing the growth of expensive long-haul connections to processing and storage centers.

Quantum Computing

By: **Bhumi Prajapati**
B.Sc. CA & IT- 5th Sem

Quantum computers are completely different from traditional computers and according to experts, the capability of a developed quantum computer is more than super computer. A quantum computer is a machine that uses the principles and laws of quantum physics to store data and perform computations. It can do very difficult tasks successfully in a few minutes which we can't even think of doing this in today's computer. The main reason behind this is that for running existing computer programs or any kind of calculation, binary digits(bits) are used so that the data is kept in the form of zero and one. All the information in our computer stays in the form of these bits. Binary Digit is used to write program in machine language which has only two values zero and one because our computer understands these binary digits only and completes the work accordingly. There are transistors in the circuit of the computer which recognize these bits and convert it into electrical signal and send the data to all the parts of computer. Quantum Digits are called Qbits. A bit used in a common computer can have only one value at a time, so the value of a bit will be one or zero, but the value of a qubit can be more than zero and one at a time. A Qbit can hold three types of values at the same time, either a Qbit will have a value of zero or it will be either one or both zero and one together. This means that a qubit can hold four values simultaneously. Quantum computers can also perform complex calculations more easily and faster than ordinary computers. The idea of quantum computer came to the mind of scientists when they understood that atom is a naturally occurring complex calculator. According to science, any atom rotates naturally just as a needle keeps rotating in a magnetic compass, in the same way it spins. It is either upwards or downwards. It is in great sync with digital technology that presents each and every data in the category of one or zero. The upward spin of an atom may be one and the downward spin may be zero, but if the atom's spin is measured, it may be both up or down at the same time. For this reason, it is not equal to the bit of an ordinary computer, it is something different, which scientists have named it Qbits, which can hold both zero and one value at the same time. It is said that the calculation speed of 40 qubit quantum computer will be equal to today's supercomputer and they will be able to calculate data much faster than today's supercomputer. The Qbits used in quantum computers are filled with such an amount of energy that to make it efficient, most of the Qbits are kept cool to zero temperature. If the temperature of these Qbits does not fall below zero, then they are not in a working condition. That is why programming in a quantum computer is done in a slightly different way, which is a very complex task to make. The field of quantum computing is important but the number of skilled people is very less. Expert believes that there can be lots of changes in areas like healthcare, communication, artificial intelligence, defence, science, agriculture with the help of quantum computer.