CHARUTAR VIDYA MANDAL'S
NATUBHAI. V. PATEL COLLEGE OF PURE AND APPLIED SCIENCES

SPECTRUM

June 2018 - Nov 2018

The measure of progress

INSIDE THIS ISSUE :

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

Dear readers

It gives me immense pleasure to announce that June-October 2018 is the eighth issue of our e-Magazine Spectrum--THE MEASURE OF PROGRESS. It is published bi-annually. This issue serves as a portal to identify and highlight the scientific segment of NVPAS family. Articles from students are reflecting their zeal and curiosity in science and technology. I congratulate them for their enthusiastic efforts in gathering the information and putting them in to their words. It would be their first article published, but in future, when the nostalgic feeling one will have on leafing through the dusty old pages it would bring surmounting happiness in travelling down the path of memory with a flow of emotions. It will definitely give the great pleasure to all the brilliant minds who passed through the porch of NVPAS learning. I am sure this issue will inspire more budding minds to contribute in next issue. I am thankful to the entire editorial team for their efforts in bringing this issue successfully.

I wish GOOD LUCK to all my dear students for their forthcoming University examination.

Keep it up!

Entrepreneurship Awareness Camp-A move for young igniting minds

By: Dr Amit Ballani
Assistant Professor
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Entrepreneurship is to explore how new businesses are launched and run. An entrepreneur is someone who has an idea to create a product or service that people will buy, by building an organization to support those sales. Entrepreneurship is the need of the hour as neither the Government nor can the private sector offer job to all degree holders. Like other skills, it can also be learned and it can transform a person from job seeker to job giver. Entrepreneurial zeal needs to be harnessed properly and objectively at a young stage so that aspirants with their multi skill capacities can start their enterprise. With an aim to develop entrepreneurial attitude Natubhai V Patel College of Pure and Applied Sciences organized three days "Entrepreneurship Awareness Camp". It was Jointly Organized by INTERNATIONAL CENTRE FOR ENTREPRENEURSHIP AND CAREER DEVELOPMENT, AHMEDABAD (ICECD) AND ENTREPRENEURSHIP DEVELOPMENT CELL of the college on 18th to 20th September 2018. This three days program was sponsored by Dept of Science & Technology.

The student participants(83) registered for this Entrepreneurship Awareness Camp had an enthusiastic interest in Entrepreneurship and were from different streams of Science (B.Sc and B.C.A) such as Industrial chemistry, Information Technology, Biotechnology, Genetics, Microbiology etc. The program began with a decent Inaugural session where the coordinators and resource persons presented a brief outline of the entire program. The Inaugural session was followed by technical sessions on various aspects of Entrepreneurship.

Next day, participants visited two Industries: Milcent Industry (Owner: Mr. Rohit Patel) and Vulcan Industry (Owner--Mr. Sanjay Gandhi). The purpose of the visit was two-fold; first is to see the working industry setup, knowhow of the manufacturing unit, branding and promotions and labour/personnel management and the second and the most important purpose was to interact with Entrepreneur : Certain lessons that these persons learnt during their entrepreneurial journey.

Overall it was interactive and informal session where student and Successful entrepreneurs interacted in discussion mode and students asked some general queries about business establishment and related issues.

The programme was concluded with a formal valedictory function of the three days event (EAC) where Dr. Bhavesh Patel, Vice Chancellor, CVM presided the function, Mr. Rohit Patel, MD , Milcent Industries & Ex. Minister, Industries & Mines, Govt. of Gujarat graced the event as "Chief Guest ". Dr. Basudeb Bakshi, Principal, NVPAS and faculties from NVPAS and all student participants attended the function.

Dr. Tejas Thakkar, Coordinator, EDC, introduced the dignitaries on the stage.

Dr Bhavesh Patel, VC, CVM, in his Presidential speech pointed a key feature of an entrepreneur--- doing more than what we are supposed to.

Shri Rohit Patel shared some case studies and asked students to start thinking of creating jobs rather than seeking jobs. He emphasized on the role of hard work, perseverance and never quitting attitude to be a successful entrepreneur.

Tardigrade:The most incredible organism on earth

By : Dhruvish J Soni
TYBSc Biotechnology

These ambling, eight legged microscopic 'water bear' " bears of the moss "are cute , water dwelling ubiquitous, indestrucible and model organism for education. It is describe by German zoologist "Johann August Ephraim" in 1773.It is the toughest animal on earth.

Facts about tardigrade--- Tardigrade means "**slow steppers".** These tiny creatures that live everywhere such as in moss , lichens,but also in bubbling hot springs, antartica ice , deep-sea trenches and Himalayan mountaintops. They also found in mud volcanoes. They survive in extreme conditions like extreme temperature , extreme pressure (high or low) , air deprivation , radiation , dehydration and starvation. by suspending their metabolism(cryptobiosis). Usually, tardigrades are about 0.5 mm (0.02 in) long when they are fully grown. They are short and plump, with four pairs of legs, each ending in claws (usually four to eight) and/or sucking disks. There are 1,150 species of tardigrades are found. The size of tardigrade is about 0.5mm , they feed upon plant cell , algae , small invertebrates. They are considered to be able to survive even complete global mass extinction events due to astrophysical events , such as gamma ray bursts or large meteorite impacts . They also survived in vacuum of space. They go without food and water for more than 30 years . Drying out to the point where 3% or less water is required for rehydrate, forage and reproduce.

They undergo **cyclomorphosis** in which they survive in sub zero temperature.Many species of tardigrade survive in dehydrated state up to 5 years or more , depending upon environment. When no water is present the organism go into **tun state** in which it is folded in loop like structure . Most tardigrades are phytophagous (plant eaters) or bacteriophagous (bacteria eaters), but some are carnivorous to the extent of eating other smaller species of tardigrades.

In this state it synthesize special molecules which feel the cell to replace loss water by forming a matrix component of cell which sensitive to dryness such as DNA , protein , and membrane will get trapped in the matrix. These molecules locked the cells prevent them for blocking , breaking and diffusing together.When dehydrated the matrix dissolved leaving behind undamaged cells. Scientist called these are **extraterrestrial beings.**

By the help of technology this organism use for build up stress tolerant crops , and stable vaccines etc .

SOPHIA ROBOT- The First Robot to Receive Citizenship

By: **Vrusha Patel**
BCA G-07

- She has a sense of humor.
- She can express feelings
- She was designed to look like Audrey Hepburn
- Her creator, David Hanson, used to be a Disney Imaginer.
- Sophia wants to protect humanity.

Sophia is a humanoid robot developed by Hong Kong -based company Hanson Robotics. In October 2017, the robot became a Saudi Arabian citizen, the first robot to receive citizenship of any country.

Sophia is an evolving genius machine. Sophia is Hanson Robotics' latest and most advanced robot to date and a cultural icon. She has become a media darling, appearing on major media outlets around the world, igniting the interest of people regardless of age, gender, and culture, even gracing the cover of one of the top fashion magazines. Her press coverage has a potential reach of over ten billion readers in 2017.

Sophia's creator, David Hanson, is the founder of Hanson Robotics and a modern-day renaissance man who has built a worldwide reputation for creating robots that look and act amazingly human. After working at Disney as an "Imagineer," Hanson aspired to create genius machines that will surpass human intelligence. Hanson believes that three distinctively human traits must be integrated into the artificial intelligence of these genius machines: Creativity, empathy, and compassion. As an extension of human intelligence, Hanson Robotics' genius machines can evolve to solve world problems too complex for humans to solve themselves. She was named the world's first United Nation Innovation Champion by United Nations Development Program (UNDP) and will have an official role in working with UNDP to promote sustainable development and safeguard human rights and equality.

Sophia was activated on April 19, 2015. The robot, modelled after actress Audrey Hepburn , is known for her human-like appearance and behaviour compared to previous robotic variants. According to the manufacturer, David Hanson, Sophia uses artificial intelligence, visual data processing and facial recognition. Sophia also imitates human gestures and facial expressions and is able to answer certain questions and to make simple conversations on predefined.

Cameras within Sophia's eyes combined with computer algorithms allow her to see. She can follow faces, sustain eye contact, and recognize individuals. Sophia is conceptually similar the computer program ELIZA, which was one of the first attempts at simulating a human conversation.

David Hanson has said that Sophia would ultimately be a good fit to serve in healthcare, customer service, therapy and education. Sophia runs on artificially intelligent software that is constantly being trained in the lab, so her conversations are likely to get faster, Sophia's expressions are likely to have fewer errors, and she should answer increasingly complex questions with more accuracy.

"THE DANGER OF THE PAST WAS THAT MEN BECAME SLAVE .THE DANGER OF THE FUTURE IS THAT MEN MAY BECOME ROBOTS.TRUE ENOUGH, ROBOTS DO NOT REBEL .BUT GIVEN MAN'S NATURE, ROBOTS CANNOT LIVE AND REMAIN SANE, THEY BECOME GOLEMS, THEY WILL DESTROY THEIR WORLD AND THEMSELVES BECAUSE THEY CANNOT STAND ANY LONGER THE BOREDOM OF A MEANINGLESS LIFE."

PLASMA, THE MYSTERIOUS FOURTH PHASE OF MATTER.

By: Gunjeet Khemka
TYBSc Biotechnology

When I was at elementary school, my teacher told me that matter exists in three possible states: solid, liquid and gas. She neglected to mention plasma, a special kind of electrified gas that's a state unto itself. We rarely encounter natural plasma, unless we're lucky enough to see the Northern lights, or if we look at the Sun through a special filter, or if we poke our head out the window during a lightning storm, as I liked to do when I was a kid. Yet plasma, for all its scarcity in our daily lives, makes up more than 99 per cent of the observable matter in the Universe (that is, if we discount dark matter).

Plasma physics is a rich and diverse field of enquiry, with its own special twist. In some areas of science, intellectual vitality comes from the beauty of grand theories and the search for deep underlying laws – as shown by Albert Einstein's account of gravity in general relativity, or string theorists' attempt to replace the Standard Model of subatomic particles with tiny oscillating strands of energy. The study of plasmas also enjoys some remarkably elegant mathematical constructions, but unlike its scientific cousins, it's mostly been driven by its applications to the real world.

First, though, how do you make plasma? Imagine heating up a container full of ice, and watching it pass from solid, to liquid, to gas. As the temperature climbs, the water molecules get more energetic and excitable, and move around more and more freely. If you keep going, at something like 12,000 degrees Celsius the atoms themselves will begin to break apart. Electrons will be stripped from their nuclei, leaving behind charged particles known as ions that swirl about in the resulting soup of electrons. This is the plasma state.

One of the biggest motivators of contemporary plasma science is the promise of controlled thermonuclear fusion, where atoms merge together and release intense but manageable bursts of energy. This would provide an almost limitless source of safe, 'green' power, but it's not an easy task. Before fusion can occur here on Earth, the plasma must be heated to more than 100 million degrees Celsius – about 10 times hotter than the center of the Sun. What's worse is that hot plasma is very unstable and doesn't like to stay at a fixed volume, which means that it's hard to contain and make useful. The physicist Lyman Spitzer started Project Matterhorn, where a secret coterie of scientists tried to spark and contain fusion in a figure-8-shaped device called a 'stellarator'. They didn't have computers, and had to rely only on pen and pencil calculations. While they didn't solve the puzzle, they ended up developing 'the energy principle', which remains a powerful method for testing the ideal stability of plasma.

Plasma is also entangled with the physics of the space around Earth. We're lucky that the Earth's magnetic field shields us from the charged plasma particles and damaging radiation of such solar wind, but our satellites, spacecraft and astronauts are all exposed. Their capacity to survive in this hostile environment relies on understanding and accommodating ourselves to the quirks of plasma.

Finally, plasmas help to explain some of the most spectacular phenomena we've observed in the remotest regions of the cosmos. Take far-away black holes, massive objects so dense that even light can't escape them. They're practically invisible to direct observation. However, black holes are typically encircled by a rotating disk of plasma matter, which orbits within the black hole's gravitational pull, and emits high-energy photons that can be observed in the X-ray spectrum, revealing something about this extreme environment.

It's been an exciting journey for me since the days I thought that solids, liquids and gases were the only kinds of matter that mattered. Plasmas still seem rather exotic, but as we learn to exploit their potential, and widen our view of the cosmos, one day they might seem as normal to us as ice and water. And if we ever achieve controlled nuclear fusion, plasmas might be something we can no longer live without.

Book your FLYING CAR soon!

Shivani
SYBSc IT

TOKYO — Electric drones booked through smartphones pick people up from office rooftops, shortening travel time by hours, reducing the need for parking and clearing smog from the air.This vision of the future is driving the Japanese government's "flying car" project. Major carrier All Nippon Airways, electronics company NEC Corp. and more than a dozen other companies — including San Francisco's Uber — and academic experts hope to have a road map ready by the year's end.

Nobody believes people are going to be zipping around in flying cars anytime soon.

Many hurdles remain, such as battery life, the need for regulations and, of course, safety concerns. But dozens of similar projects are popping up around the world.A flying car is defined as an aircraft that's electric, or hybrid electric, with driverless capabilities, that can land and takeoff vertically.

They are often called EVtol, which stands for "electric vertical takeoff and landing" aircraft.All the flying car concepts, which are like drones big enough to hold humans, promise to be better than helicopters, which are expensive to maintain, noisy to fly and require trained pilots.Google, drone company Ehang and car manufacturer **Geely in China, and Volkswagen of Germany have invested in flying car technology**.

Nissan and Honda said they have nothing to say about flying cars, but Toyota recently invested $500 million in working with Uber on self-driving technology for the ride-hailing service. Toyota group companies have also invested $375,000 in a Japanese startup, Cartivator, that is working on a flying car.**The hope is to fly up and light the torch at the 2020 Tokyo Olympics**, but it's unclear it will meet that goal: at a demonstration last year the device crashed after it rose to slightly higher than eye level. A video of a more recent demonstration suggests it's now flying more stably, though it's being tested indoors, unmanned and chained so it won't fly away.Tesla CEO Elon Musk says even toy drones are noisy and blow a lot of air, which means anything that would be "1,000 times heavier" isn't practical. Uber says it is considering Tokyo as its first launch city for affordable flights via its UberAir service. It says Los Angeles and Dallas, and locations in Australia, Brazil, France and India are other possible locations.Unlike regular airplanes, with their aerodynamic design and two wings, Uber's Elevate structures look like small jets with several propellers on top. The company says it plans flight demonstrations as soon as 2020 and a commercial service by 2023.Uber's vision calls for using heliports on rooftops, but new multifloor construction similar to parking lots for cars will be needed to accommodate so many more EVtol aircraft, if the service takes off.

Unmanned drones are legal in the U.S., Japan and other countries, but there are restrictions on where they can be flown and requirements for getting approval in advance.

Flying passengers over populated areas would take a quantum leap in technology, overhauling aviation regulations and air traffic safety controls, along with major efforts both to ensure safety and convince people it's safe.Uber said at a recent presentation in Tokyo that it envisions a route between the city's two international airports, among others.

Concepts for flying cars vary greatly. Some resemble vehicles with several propellers on top while others look more like a boat with a seat over the propellers.

Japan's auto and electronics industries have the technology and ability to produce super-light materials that could give the nation an edge in the flying car business, he said.The devices might need parachutes to soften crash landings, or might have to explode into small bits to ensure pieces hitting the ground would be smaller.

"I think one of the biggest hurdles is safety," said Taguchi, a digital mechanic professor at Japan "And anything that flies will, by definition, crash."

Artificial Intelligence: An overview and brief history.

By: **Nirali Lad**
T.Y. BSc Bioinformatics

Defining Intelligence may include the capacity for logic, understanding, self-awareness, learning, emotional knowledge, reasoning, planning, creativity, and problem solving. Artificial intelligence or AI can be defined in simplest terms as, 'the ability of a computer program to think and learn by itself (machine learning) and work accordingly'. The idea of inanimate objects coming to life has been around for a long time. The ancient Greeks had myths about robots, and the Chinese and Egyptian engineers built automatons (mechanical device made in imitation of a human being). The beginnings of AI can be traced back to classical philosophers, who attempted to describe human thinking as a symbolic system.

But talking about AI In the modern sense, it was Alan Turing, who is known as father of Computer Science and AI, who first posed the question, "Can machines think?" in a 1950 paper titled Computing Machinery and Intelligence. But the field of AI was formally founded in 1956 at a conference at Darthmout College, where. John McCarthy coined the term 'Artificial Intelligence', which we all use today.

Achieving artificially intelligent machines wasn't so simple. Due to no progress in the research of AI, government fundings and interest in the field dropped off twice - a period of 1974-1980 and 1987-1993 which came to be known as the 'AI winter'. But later, the research began to pick up again, and in 1997, IBM's Deep Blue became the first computer to beat a chess champion when it defeated Russian grandmaster Garry Kasparov. And then in 2011 IBM's question-answering computer named 'Watson', won the quiz show

'Jeopardy' by beating the champions. Early forms of AIs were also chatterbots, the earliest being ELIZA, created by Joseph Weizenbaum in 1966. He coached it to learn the English language in a natural form. His work ended up being the gold standard in the field of chatbots and till today, the modern chatbots are based on the same fundamental design.

Al is a relatively new branch and it still can't be thoroughly explained. But broadly speaking, there are two branches of AI, Strong AI and Weak AI. Talking about Strong AI, every part of fiction that we've read or seen right from Iron Man's Jarvis to A Hitchhiker's Guide to the Galaxy - focuses on Strong AI. In short, Strong AI is about building a machine that is capable to emulate the human mind to such extent that it matches or exceeds it. Strong AI requires the machine to be able to think freely, outside the programming guidelines given to it. Of course we are relatively far from the practical existence of such machines, but that is where the goals of science are headed. Rather more actively in use today is the Weak AI. It is a system that uses a set of pre-programmed rules to accomplish a task. Simply saying, it is about a large and complex set of "if-else" instructions. Although not as glamorous as the Strong AI, at present we can see a wide range of AIs around us. Right from the the virtual assistant's of our phones which can perform various tasks just by receiving a voice command; to autonomous cars.

The idea of truly "intelligent" system is perhaps best represented in the form of self-driving cars and aircrafts. It has been many years since scientists have started working on self-driving vehicles, but only recently it has come to a point where testing these vehicles can be considered safe. Google's self-driving car which is now under WAYMO is now a fully functional self-driving car. One research group from Stanford University has also been able to develop an artificial intelligence system that enables robotic helicopters to teach themselves difficult stunts by watching other RC operated helicopters perform the same. Apart from that, there is an annual competition named 'Robocup' in which a team of mini humanoid robots compete in a game of football. While most of the other teams used hand-coding, choosing where to put the joints, how to tweak the walk and playing patterns etc. The UT Austin Villa team used a distributed computing cluster in order to do machine learning. As a result their robots came up with this walk that was able to beat anything the other teams had. And this year the technologies like natural language processing, Google's game playing AI Alpha Go, Facebooks chatbots etc. have been at a boom.

Artificial Intelligence has already gotten to the point where the kinds of things computers can do are jaw dropping. Yet we are still at an early age and there is a long way to go. The question of time needed for AI to mature has been often asked and there are various mixed responses about that. But only with time will we be able to see that how long it takes us to develop true artificial intelligence like a fully functional human brain emulation or a machine with complete human feelings; just like the ones we've seen or read in fiction. Let's see what the coming era of AI brings for us.

Transition Metal Dichalcogenides (TMDC)

Dr Mehul Dave

In recent years there has been a considerable interest in the study of the high pressure behavior of solids because of academic, technological and geophysical reasons. The academic interest owes its origin to the fact that at high pressure the nature of the interatomic forces in matter change considerably. These changes in solids can be studied in greater detail to reveal several new features of the interatomic forces, which are responsible for their diverse physical properties. The properties of materials having a lamellar structure have been studied for last few years. Some elements, oxides, hydroxides, halides, chalcogenides and other various complex systems exhibit the lamellar structure. Many of these materials are found in nature and remaining can be synthesized in the laboratory. Layered (lamellar) structure solids of transition metal dichalcogenides have been extensively studied. Among these the binary compounds with Nb as cation and S / Se as anion form a very interesting class of lamellar semiconductors. Transition metal dichalcogenides exhibit fascinating properties due to their van der Waals bonded layered structure, including charge density wave instabilities. Layered transition metal dichalcogenides (TMDC) of the type MX_2 (M= metal atoms and X = chalcogen atoms) exhibits interesting physical and structural properties as have been reviewed by some leading scientists. TMDC have various characters of metal, semiconductor and magnetic substances and have been widely studied. The transition metal dichalcogenides, NbS_2 and $NbSe_2$, are layered compounds consisting of sandwiches with strong covalent/ionic interlayer bonds and weak van der Waals interalayer interactions.

Niobium dichalcogenides 2H- NbX_2 (X = S, Se) take a layered structure, which consists of a sequence of X-M-X (M = Nb, X = S or Se) have been important materials as mother crystals for doped compounds. The end numbers of series NbS_xSe_{2-x} ($0 \leq x \leq 2$) become superconductor at low temperature. The superconducting parameters of the pure and doped crystals have been extensively studied. The discovery of superconductivity led to an upsurge of interest in the properties of the layered transition metal dichalcogenides. Layered transition metal dichalcogenides have attracted much interest due to their various kinds of charge-density wave (CDW) transitions. A layered transition-metal dichalcogenides 2H- $NbSe_2$ is a highly two dimensional anisotropic superconductor, which coexists with the charge density wave (CDW) state. NbS_2, due to its ability to reversibly intercalate alkaline ions at room temperature, seems interesting from the viewpoint of electrochemical applications. NbS_2 exhibits significant nonstoichiometry, which affects the properties of this system. The negative dynamic creep rate, i.e. increasing irreversibility in the magnetic hysteresis loop for decreasing sweep rate of the magnetic field, in a 2H- $NbSe_2$ single crystal. The result of magnetization measurements made on a $NbSe_2$ single crystal for magnetic-field orient ations both along and perpendicular to c-axis of the crystal. Recently, both theoretical and experimental interest has been turning to the behaviour of the vortex lattice in type–II semiconductors moving under the action of Lorentz forces from an applied current. $NbSe_2$ is particularly well suited for a μSR study of the vortex state since the geometry of the vortex lattice is well established. Several researchers have synthesized and characterized nanotubes and nanowires of metal dichalcogenides and other inorganic materials in the last three to four years. The formation of a nanotube is generally limited to few layered compounds. It is reported that an $NbSe_2$ nanotubes can be prepared by the use of intense electron irradiation. $NbSe_2$ nanostructure was investigated for superconductivity. IV The size effect on the flux pinning under an arbitrarily oriented magnetic field in the mixed crystals of 2H-NbS_xSe_{2-x} has been investigated by the earlier researchers. Looking to the importance of these compounds (NbS_2 & $NbSe_2$) it is desired to have another group of compounds in the form of a series NbS_xSe_{2-x}, having NbS_2 and $NbSe_2$ as end member, which may exhibit interesting properties.