Royal Science Magazine

Volume 1, Issue 1
January-March 2022

Into the First Issue

Science in Pictures
Top Start-Ups
Space Travel
Fun Science
Articles

In This Issue

On the Cover

Vol.1, Issue 1, 2022

Into the First Issue

On behalf of The Royal Science Magazine, co-editors, reviewers and writers, I am delighted to announce the successful publication of the first issue of the magazine. When I put out flyers seeking contributions for the magazine's initial issue, one of the first responses I received was, "Why?" What is the need for this? Isn't it true that there are already enough Science Magazines? "What is the point of adding another?" Of course, these were reasonable questions, given that India now has handful of quality science periodicals.

This was not the situation decades ago. But today there are a slew of them springing up in every part of the nation. However, even today, the majority of them are geared at academics and are not intended for dissemination of science and technology to the youngsters or to the common public. As a result, The Royal Science Magazine is established to fill the need. This magazine is the outcome of not just over a night work but dedicated, ambitious and brain child of The Royal Science Forum, which steps into 10^{th} year of its scientific service.

Unlike most others, this publication is not of the pay-to-publish sort, since it is based on the basic principle of disseminating high-quality science to aspiring people. Keeping this in mind, articles are picked based on how valuable they would be for a common man to know more about the new things in science. The goal has been to introduce public to a broad range of science issues as well as to acquaint them with little esoteric topics that they would be scared of otherwise.

I feel that articles of this kind are required since today's youngsters will soon be competing for space with present global leaders. This publication also includes interviews and success stories of the legends. Finally, the publication supports the researchers, as seen by the inclusion of articles from different scientists working at different parts of the country.

I appreciate all of the writers, editors, and reviewers for their tireless work and patience. I hope that this magazine will be warmly received by students, researchers, and academics alike, and that everyone will be pushed to accomplish even greater than we now feel we are capable of.

Soundar

Editor, RSM

The Royal Science Forum

The Royal Science Forum is a technical professional platform that was founded in 2013. RSF strives to bring together scholars, academicians, and industry professionals. Through its several divisions, RSF's mission is to assist the international science and engineering community by disseminating information on current developments in various disciplines of science and engineering. Further, recognition of talents among students, young and expertise researchers/academicians by means of Awards is also a mission of RSF. With our potential connections, we provide details of job opportunities such as Postdoctoral Research Position, Research Associate, Junior Research Fellow, Senior Research Fellow, academic jobs and non-academic jobs. We also provide details of fellowships and scholarships for Masters and Ph.D. students. From January 2022, The Royal Science Forum releases "The Royal Science Magazine".

The Royal Science Magazine is an Outreach/Extension Magazine where the advancements in Science and Technology from all fields are presented in a simplest manner to as to reach the public. Authors are welcome to submit their contribution as per the guidelines given in the "Royal Science Magazine" section. For more details about the forum and the scientific services, visit **www.royalsci.com.**

Interplanetary Highway for Space Travel

A "highway" across the solar system, like a huge network of virtual meandering tunnels and conduits surrounding the Sun and planets, as envisioned by a NASA engineer in Pasadena, California might reduce the amount of fuel required for future space voyages.

Image credit: NASA/JPL

The system, dubbed as the Interplanetary Superhighway, was designed by Martin Lo, whose software was used to assist in the planning of the flight route for NASA's Genesis project, which is presently utilising this "freeway in space" to gather solar wind particles for return to Earth. The majority of missions are built to take advantage of the gravitational pull on a spacecraft when it passes by a body like a planet or moon. The Sun's pull on the planets, or a planet's attraction on its adjacent moons, is another feature that scientists' hypothesis takes use of. Forces from numerous directions essentially cancel each other out, allowing routes for spacecraft to move across the gravitational fields.

Each planet and moon have five Lagrange points in space where the gravity of one body balances the gravity of another. There is enough fuel for spacecraft to circle there while consuming relatively little. Scientists plotted various probable flight routes among the Lagrange points to discover the Interplanetary Superhighway, changing the distance the spaceship would travel and how quickly or slow it would fly.

Top Start-Ups to Watch in 2022

It's a start-up boom in India, fuelled by an unprecedented round of investment for Indian businesses across all industries. Until December 2021, more than $38 billion has been raised.
Here are the Top Indian Start-ups of 2021

The impact of Covid-19 on world healthcare was huge and terrifying, with the threat of widespread infection looming over the populace. The worldwide mortality toll would have been substantially higher if healthcare professionals had not gone above and beyond to assure the easy recovery of individuals who had been infected. As the globe went into lockdown, healthcare, as well as solutions for the industry, became critical. In a year when many startups were on the verge of failure, healthcare technology businesses raised unprecedented tons of capital. In this line, Innovaccer was one of the brightest startups from India.

Healthcare data is analysed by this corporation, which creates solutions for western markets such as the United States, to deliver insights to healthcare practitioners, hospitals, insurance companies, and other organisations and enterprises.

Several governments and private entities using the programme to keep track of more than 3.8 million individuals' medical information, saving $400 million for healthcare professionals. Over the next five years, the company hopes to increase the amount of patient records it has to 100 million or more and reach out to 500,000 caretakers.

The COVID-19 situation has paved path for many of the e-learning startups to flourish. With its consistency and quality delivery of variety of contents, Unacademy has become famous widespread. Unacademy, an e-learning start-up based in Bengaluru, India, was formed in 2015. The company focuses on training for a variety of exams, including UPSC, SSC, CAT, and IIT JEE, among others. It bills itself as the "Netflix of education," and its

value has risen to $3.44 billion as it looks to expand into new areas like as upskilling and creator.

PharmEasy is a chronic care company launched in 2015 by Dharmil Sheth and Dr. Dhaval Shah. It provides services like as teleconsultation, prescription delivery, and sample collection for diagnostic testing. It links approximately 60K pharmacies and 4K physicians throughout India's 16K postal codes.

The company's merger with Medlife came as a result of increased competition in the industry. Reliance had bought competitor Netmeds, Amazon had formed its own epharmacy division, and Flipkart was considering doing the same. The sole remaining competitor was 1mg, which was also takenover by Tata Group. In this year, the firm intends to beat out the competition and reach 100K pharmacies.

Ronnie Screwvala, Mayank Kumar, Phalgun Kompalli, and Ravijot Chugh founded upGrad, which provides higher education courses in partnership with a number of institutions.

It claims to have over 2 million students enrolled. Screwvala, who also serves as the company's chairman, said that the edtech firm would provide more information on the merger and purchase in the following days. The fundraising round occurred only days after the business announced the acquisition of Bengaluru-based KnowledgeHut in order to expand into short-term skilling courses.

Vedantu, an online web tutoring platform founded in 2014 by Krishna, Anand Prakash, and Pulkit Jain, contends to have over 35 million students attending live classes every month and teachers delivering 8 million hours of LIVE classes, with an expansion of 220 percent during the early months of the lockdown. After collecting $100 million, the Bengaluru-based online teaching business became the sixth Indian edtech unicorn.

Nobel Laureate Dan Shechtman

In this column, the magazine will cover on how the famous people get in the position where they are today. And this month's famous personality is Nobel Laureate Dan Shechtman.

Dan Shechtman is a Professor of Materials Science at Iowa State University and the Philip Tobias Professor of Materials Science at the Technion – Israel Institute of Technology. He is also an Associate of the US Department of Energy's Ames Laboratory. Shechtman discovered the icosahedral phase in 1982, while on sabbatical at the US National Bureau of Standards in Washington, D.C., launching a new area of quasiperiodic crystals. Professor Linus Pauling was his team leader.

> *"Check yourself ten times before you start talking. Make sure you don't make a mistake. But as an expert, trust yourself"*

Shechtman faced animosity from Professor Linus Pauling, a double time Nobel Laureate, against the non-periodic interpretation from the day he published his results. In a press release after Dan's Nobel Prize, he said, "It was me against the world for a long time". Dan said that he was the target of mockery and lectures on the fundamentals of crystallography. The two-time Nobel Laureate Linus Pauling, the American Chemical Society's hero and one of the world's most prominent chemists, led the charge against my results. Dan said that "He was incorrect, and after a time, knowing that he was wrong, I began to relish every second of this scientific conflict." "There are no quasicrystals, just quasi-scientists," Linus Pauling is quoted as stating.

One fine day, his group leader, Linus Pauling came to Shechtman's office, smiling sheepishly and put a book on his desk on x-ray crystallography. He told Shechtman to read that book and so that Shechtman can understand the fundamentals of crystallography. In his reply, Shechtman said "I don't need to read the book. I'm a professor at the Technion. My material is not in the book". A few days later, the group leader told him, "You are a disgrace. I want you to leave. I cannot have my name associated with you." So Shechtman had to leave his group but found another researcher there who was willing to adopt a scientific orphan.

In an interview to APS, Shechtman advised the young scientists, "Number one, become an expert in something you like. Try to be the best in something you like. Once you are an expert and someone criticizes you, then you can say "you may be the greatest scientist in the world but I am an expert in this". Number two, pay attention to details, especially surprising details that you don't expect. And if you find something strange, don't let it disappear. Study and find out what it is. Sometimes it will be an artifact, but in some cases, you've made a great discovery that will determine your success in science and your career. And if somebody says this is rubbish, then say "don't tell me it's not in the book. Show me what's wrong". Check yourself ten times before you start talking. Make sure you don't make a mistake. But as an expert, trust yourself."

Pearl or Blister

Marine oysters and freshwater mussels produce pearls as a natural defence against irritants such as parasites penetrating their shells or injury to their delicate bodies.

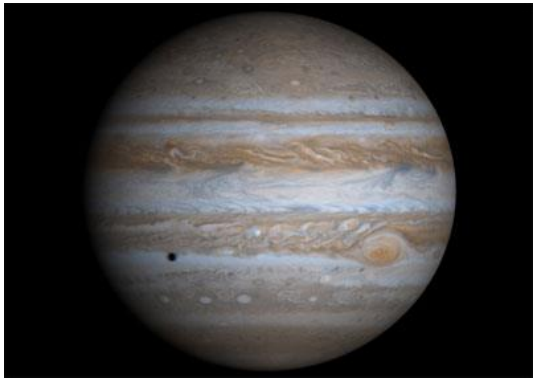
Layers of aragonite and conchiolin, which also make up the oyster or mussel's shell, are slowly secreted by the oyster or mussel. This results in the formation of nacre, often known as mother-of-pearl, which encases and shields the mollusc from the irritant.

In order to enhance the development of seed-of-pearl, an irritant is manually introduced into a mollusc when pearls are grown commercially. Nacre may spontaneously develop around practically any irritant that enters the shell, resulting in some very rare and valuable pearls. Pearls may be produced by other bivalve molluscs and gastropods, but they are not formed of nacre.

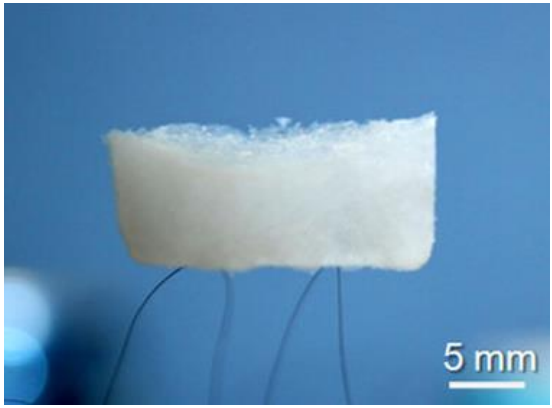
Present or Past

If an alien located at 60 million light years away from earth and looking at us today through a powerful telescope, then they would see dinosaurs going around the earth only. This is because, whatever we see today are nothing but the interaction between the matter and light. In this sense, when an alien at a distance of 60 million light years attempts to see us, they receive the light that has originated 60 million light years before on earth.

Gas Planet



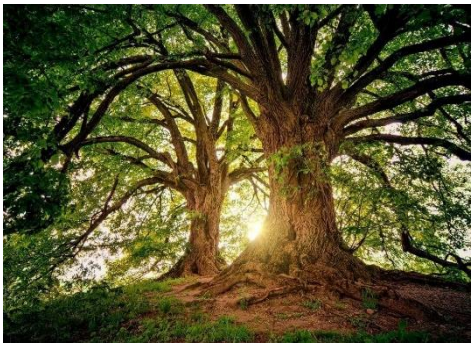
Jupiter's composition is similar to that of a star. Jupiter would have become a star rather than a planet if it had been 80 times more massive. Jupiter is normally the second brightest planet in the night sky, behind Venus, as seen from Earth. Jupiter is named after the ruler of the Roman gods in mythology. The planet Jupiter is classified as a gas giant. Its atmosphere, like the sun's, is mostly hydrogen and helium gas. The planet is covered in dense clouds of red, brown, yellow, and white. Jupiter Hence, if you jump on it you can never touch the ground (Image credit: NASA).



Aerogel is a porous lightweight synthetic material formed from a gel in which the liquid component has been replaced with a gas without causing the gel structure to collapse significantly (Credits: Wikimedia). As a consequence, the solid has an exceptionally low density and thermal conductivity. Because of its transparent quality and the way light scatters through the substance, it's also known as frozen smoke, solid smoke, solid air, solid cloud, and blue smoke. Silica aerogels have the sensation of fragile expanded polystyrene, whilst other polymer-based aerogels have the feel of stiff foams. A number of chemical substances may be used to make aerogels.

Talking Trees

One might have seen a scientist finding biochemical interaction between trees in Avatar Movie. It may appear to be a science fiction,



but the truth is that the trees on our mother earth communicate with each through a unique biological system.

Mycorrhizae are found all over the world. Hundreds of kilometres of tightly packed fungal strands might be covered by each step you take through a forest. These are the wood-wide web's fibre optic cables.

The fungus establishes mycorrhizae with plant roots, and nutrients necessary for both species' growth travel via these linkages. For decades, this interaction has been thought of as a straightforward trade between plants and fungus: plants offer carbon-rich sugars produced by photosynthesis in exchange for nutrients scavenged from the soil by fungi.
Another level of contact exists: an exchange not just between the fungus and the plant, but also between neighbouring plants that uses fungi as a conduit.

The fungal threads may connect to different plants as they expand, forming webs known as 'common mycorrhizal networks.' Plants may exchange sugars, nutrients, water, and other things via these networks.
Plants seem to be able to give mutual support and help create the habitats they live in by keeping linked. Forests, with all of their inhabitants connected, resemble gigantic superorganisms rather than collections of people.

The wood-wide network, on the other hand, isn't limited to forests. Mycorrhizae may be found in all types of flora, from tropical rainforests to Arctic tundra, and they help the great majority of terrestrial plants flourish.

They establish intricate networks that typically include not only several plants but many species, and various elements may be traded depending on the kind of fungus involved. Researchers have shown that plants linked to the wood-wide network may trade more than only nutrients in recent years.

FUN SCIENCE

	1			
				2
	3			
				4
		5		

This is a Sudoku game with a difference. Fill up the grid above with the numbers 1-5 in every row, column, and shaped box. **Send your answers by 15.02.2022 to editor@royalsci.com.** Winners will be announced in the next issue. Winners receive certificate.

What is the lowest number of movements each knight needs make to place the white knights on the squares now held by the black knights, and vice versa, according to chess rules? **Send your answers by 15.02.2022 to editor@royalsci.com.** Winners will be announced in the next issue. Winners receive certificate.

Q&A Corner

Readers can send questions related to scientific phenomenon or technological functioning to **editor@royalsci.com**. The questions will be answered by the experts in the next issue.

NANOPLASTICS – AN UNDERESTIMATED AQUATIC POLLUTION

Plastics makes up approximately 80% of all waste discovered in our seas, and it breaks down into smaller and smaller particles over time. People around the globe has knowledge on the plastic pollution and recently they are little aware about the microplastic pollution. Unfortunately, they are unaware about the nano plastics pollution in the environment and ocean. The depressing legacy of our modern lifestyle of people around has contributed to the giant vortices of floating plastic rubbish in the world's oceans. Weathering and degradation processes produce a slew of microscopic particles and the tiniest particles of these microscopic particles are known as Nano plastics. As a result, there is rising worry about the possible negative impacts of nano plastics on many ecosystems in the marine environment.

Credits: Jedimentat44@flickr

Aquatic Plastic pollution and Nano plastics

Plastic contamination in the ocean is a big and growing global issue. The oceans are believed to contain approximately 150 million tonnes of plastic, with about eight million tonnes of plastic ending up in

ARTICLE

the ocean each year. Plastics take a long time to deteriorate. Because of the vast volumes of plastic trash and its potential impact on marine ecosystems and food security around the world, the life cycle and fate of plastic waste materials in the marine environment is a major concern at the moment. Plastics are frequently broken down into tiny particles in the marine environment by the sun, waves, wind, and microbial action. Barnacles, tube worms, and sea squirts are filter feeders that may absorb micro and nano plastic particles in the water.

Nano plastics and Its effects on Aquatic organisms

Researchers from Lund University Sweden has look in to the effects of nano plastics on aquatics species and its interaction with the food chain. Nanoplastics are tiny pieces of plastic less than 1 micrometre in size and can potentially contaminate food chains when they have reached the oceans or lakes. Since they degrade slowly, they can cause deadly implications to their inhabitants of lakes or oceans. Researchers from National University of Singapore has identified that once nano plastics enters the food chain of aquatic species it can in turn ultimately enter the human food chain.

The barnacle larvae cultured in solutions of their regular meal combined with plastics measuring about 200 nanometres in size by the NUS researchers. They revealed that nano plastics are easily absorbed by marine animals, and that they build in the species over time, providing a threat to food safety and posing health hazards. Barnacles may be at the bottom of the food chain, yet what they eat is passed on to the species that consume them. In addition to that, plastics are capable of absorbing pollutants and chemicals from the water. If plastic particles are swallowed, these toxins can be passed on to creatures, causing severe harm to marine ecosystems and human health.

Many other aquatic animals eat zooplankton like Daphnia, thus the researchers looked at the impact of plastic particles at the food chain level. Fish that ate Daphnia with nanoplastics had a change in predatory behaviour and a low appetite, according to the researchers. Researchers revealed that the nanoparticles could pass biological barriers like the gut wall and the brain in many trials.

Under Estimated Problem of Nano plastics

The preceding findings of Researchers from Lund University and National University of Singapore has insisted that the nano plastics

should be considered as a problem of high importance. The effects on the aquatics species needs additional research.

Many of the times, entry of new and unfamiliar items in our society are met with a zero-risk mindset at first. And, especially in the case of nano plastics, this is understandable. But once its interactions in the food chain are known, people may change their attitude towards the nano plastics because, "who wants plastic in their food?" Research at various stages of the aquatic food chain is required to determine the problem.

Conclusion

At present the effects are nano plastics are determined at level of exposure of aquatic organisms in the food chain level. But further more studies are required from the various parts of the world to determine the toxicity of these nano plastics. Despite the toxicity the chemical composition studies are required more on finding out the effects on nano plastics on environment as well as in human food chain interactions. As of now, "we cannot claim the problem is large" nor "can we say we have no difficulty at all." Research on nano plastics and better understanding of the pathways of nano plastics pollution can curfew the effects as of now. Since the nano plastic pollution has intensified, it's better to have prudence in the usage of plastics.

The current researches have not enlightened the long-term effects of nano plastics on marine environment, aquatic species and biological interactions. Among them it is not possible to pinpoint out the effects. Until then we can have a control over that by reducing the use of substantial amount of single use plastics. As a result, less plastic in the environment that can reduce the number of nano plastics, and each of us can play a role in preventing the pollution of the environment by plastic trash.

This article is written by the authors: Monikandon Sukumaran, Kesavan Devarayan, and Ramar Marimuthu, Tamil Nadu Dr.J.Jayalalithaa Fisheries University, Nagapattinam, College of Fisheries Engineering, Nagapattinam. Authors can be contact at Email: *monikandon@tnfu.ac.in*

Call For NOMINATIONS

2022 The Royal Science Awards

Life Time Achievement Award
Senior most Researchers/Academicians who made excellent contribution to their stream are given this award.

Young Researcher Award
Budding researchers (upto 35 age) who have given excellent contribution are given this award.

Best Teacher Award
Teachers of all streams who have contributed to the learning community are given this award.

Student Project Awards
Graduate students who have come up with innovative ideas and products are welcome to submit their application.

Best Thesis Award
The students from any stream who have done excellent research work at any degree/diploma level can apply for this award.

Best Extension Worker Award
This award is given to those who transferred more technologies to the common people and/or developed excellent communication/service tools such as apps, websites for communicating to the beneficiaries.

Visit www.royalsci.com to file your nominations.

Apply for the Awards
You can submit your application for the awards through the website. Applications are open throughout the year.

Benefits of the Awards

- The awardees will get an opportunity to chair and deliver invited talks in the seminars, conferences, and workshops organized by the Royal Science Forum
- Recognition among peers
- This award is a kind of motivation for further innovation and best practices.
- This award is an indicator of success and it enhances the reputation and improves the benchmark of the award winner
- As a matter of pride and motivation, it raises the visibility of the success.
- The award will be a testimony of your success
- Awards winners profile shall be included in the Book, " The most accomplished individuals from around the world" released every year

CLIMATE CHANGE AND ITS IMPACT ON FISHERIES

Climate change now encompasses both human-caused global warming and its effects on Earth's weather patterns. Climate change has happened before, but the current changes are happening quicker than any other time in Earth's history. The primary cause is greenhouse gas emissions, particularly carbon dioxide (CO_2) and methane. The combustion of fossil fuels for energy is responsible for the majority of these emissions. Agriculture, steelmaking, cement production, and forest loss are some of the other sources. These factors together accelerate the global warming. Climatic changes especially have always had an impact on fisheries and on all other agricultural sectors. Over the next 50 to 100 years the atmosphere and the ocean will continue to warm, sea levels will rise due to thermal expansion of water and glacier melting, ocean pH decreases as more carbon dioxide is absorbed and circulation patterns may be changed on a local, regional and global scale.

Green houses and global warming

According to the researchers the global anthropogenic greenhouse gas emissions in 2018, excluding those resulting from land use change, totalled to about 52 billion tonnes of CO_2. CO_2 accounted for 72 percent of these emissions, whereas methane accounted for 19 percent, nitrous oxide accounted for 6% and fluorinated gases accounted for 3%.CO_2 emissions are principally caused by the combustion of fossil fuels for transportation, production, heating and power. Deforestation and industrial operations contribute to additional CO_2 emissions, which include CO_2 emitted by chemical reactions used to make cement, steel, aluminium and fertilizer. Livestock, manure, rice farming, landfills, wastewater, coal mining, oil and gas production together contribute to methane emissions. Nitrous oxide emissions largely come from the microbial decomposition of fertilizer. Electricity and heat 25 percent, agriculture and forestry 24 percent, industry and manufacturing 21 percent, transportation 14 percent, and buildings 6 percent are anticipated to be the leading sources of worldwide greenhouse gas emissions.

Climate change and its impact of physical changes in fisheries

Increase in Water temperatures: The oceans have a key role in global climate regulation. Because their heat capacity and the net heat uptake are around 1000 times greater than that of the atmosphere, oceans

absorb a significant quantity of heat generated globally. Changes in ocean temperatures have the potential to alter the dynamics of the region's aquatic habitats. Changes in ocean dynamics may cause changes in fish migration patterns and as a result reduction in fish landings, particularly in coastal fisheries. Biodiversity is also threatened by rising water temperatures. Fish have a temperature preference that optimises physiological activities in general. When water temperatures rise above a species maximum acceptable threshold the species survival is jeopardised.

Credit: Australian Institute of Marine Science

Sea Level Rise: Globally, sea level has risen by 10 to 20 cm during the twentieth century, owing largely to thermal expansion and by 2100, global rise in sea level of between 9 cm and 88 cm is predicted, based on the full range of 35 climate projection scenarios offered by the Intergovernmental Panel on Climate Change. Sea level rise in coastal locations may modify the salinity of estuarine habitats, inundate wetlands and reduce or remove the amount of submerged vegetation, posing a threat to species that rely on these coastal environments for reproduction and recruitment.

Furthermore, with the rising sea levels, infrastructure which are used for current fishing such as jetties and fish storage centres placed on the coastal margins just above the mean high tide line may be

susceptible to increasingly frequent tidal and storm inundation. Sea level rise will almost certainly have a severe influence on fishery production due to salt stress on fish stocks and habitat as well as fish landing, processing and marketing facilities.

Increasing Water Salinity: Climate change has the potential to raise or decrease water salinity in a variety of ways. While tropical waters are becoming increasingly salty, oceans closer to the poles are becoming fresher. This indicates that tropical oceans are more vulnerable to the effects of rising water salinity than waters at higher latitudes. Depending on the species tolerance level and the type of their ecosystem whether freshwater, marine or estuarine changes in water salinity have distinct impacts. As a result of anthropogenic climate change, the salinity of some freshwater ecosystems is also expected to increase. By impairing the organism's ability to osmoregulate such physical alterations will have a negative influence on the population of both plankton and larger prey fish species.

Ocean Acidification: The world's oceans are acidifying at an alarming rate increasing acidity caused by dissolved CO_2 in saltwater has a deleterious influence on ocean ecosystems.

Direct effects according to researchers the changes include in the physiological processes such as lower calcified structure growth, otolith formation and fertilization success. These could have direct effects on the whole organism such as lower growth and reproductive output, increased predation and mortality, changes in eating rates and behaviour, decreased immunocompetence and reduced heat tolerance. Changes in predator or pray abundance, effects on biogenic ecosystems such as coral reefs and changes in nutrient recycling are all examples of indirect effects. Adult fish appear to be well equipped to deal with low pH environments or greater CO_2 levels in seawater but their egg and larval life stages may not be so fortunate. Ocean acidification has the potential to stifle the growth of plankton and invertebrates at the bottom of the food chain. As a result, acidification can alter productivity at specific trophic levels, altering the complex food chain of aquatic ecosystems and having an impact on fisheries production.

Climate change and its impact of biological changes in fisheries

Climate change is already altering the patterns of certain essential biological processes, resulting in changes in primary production and fish distribution. Climate change related changes in primary production and fish stock distribution have a negative influence on food security in many tropical coastal states.

Primary production changes: The link between future ocean primary production and climate change is projected to be a major limitation on fish and fisheries productivity. The availability of sufficient and acceptable food is regarded to be critical for fish larvae's survival during the planktonic stage. As a result, in addition to the consequences of changes in production, climate induced variations in the distribution and phenology of fish larvae and their prey can have an impact on fish stock recruitment and production. Although there are many elements that influence primary production in aquatic environments, one of the most important is the increase in surface temperature.

Changes in Fish distribution: Fish species modify their latitudinal and depth ranges in response to environmental changes such as rising water temperatures. Changes in ocean dynamics could cause changes in fish migration patterns and possibly lower fish landings, particularly in many African countries' coastal fisheries. Changes in fish stock distribution have different effects at different latitudes. Some fish species will travel to higher latitudes in pursuit of areas with the best water temperature, potentially increasing fish harvest.

Conclusion

The awareness on climate change and global warming is known to an extent but the general publics are almost unaware of the impacts caused to the Fisheries and fish stocks by the climate change and greenhouse gases. Efforts taken by various countries for reducing the emission of greenhouses gases around the globe has led the way for reduced emissions of these pollutants but till it has not achieved to an efficiency for the world to regain back the past climate. Despite of the impact on the environment, further more studies are required on climate change and its direct and indirect effects on fish primary stocks, production, fish distribution and fish harvest along the various coast in the world. These changes in fisheries will have a direct impact in several countries and food security. Few countries directly depend on fisheries and fish harvest for micro nutrients and cheap protein source. Long term effects and consequences have to be assessed immediately to further mitigate the climate change impact on fisheries.

This article is written by the authors: Monikandon Sukumaran, Kesavan Devarayan, Theivasigamani Anand and Ramar Marimuthu, Tamil Nadu Dr.J. Jayalalithaa Fisheries University, College of Fisheries Engineering, Nagapattinam. The authors can be contacted at Email: *monikandon@tnfu.ac.in.*

ARTIFICIAL INTELLIGENCE: A NOVEL TOOL FOR DISEASE DIAGNOSIS IN CROP PROTECTION

In 2050, the population may reach >840 million people in the world. it is an alarm that threatens world agriculture production and demand. It creates demand including starvation of nutritional status and epidemics in humans due to least production, uneven distribution and products of unhealthy nature. Mostly, these tragic issues are caused by biotic and abiotic stresses of diseases, pests accompanied with climatic, geographical factors and provided heavy loss in productivity. Last 50 years, science has developed well in agricultural production and their allied sectors. In spite, the loss occurred due to emerging diseases, pests and abiotic factors. Currently, several technologies are used to detect the diseases, pathogen's characters, pest upsurge from field to lab by disease forecasting models, field and molecular aspects of identification based on (field visit, sample examine, DNA/RNA, nucleic acids-probes, biochemical metabolites and toxins). But we lack knowledge in specific identification and detection of sources from where. Under this situation, a new application tool is essential for detection of diseases and pests before or during their occurrence at initial. An alternative strategy pulled machinery knowledge into agriculture. It's otherwise called "artificial intelligence" (AI) [1].

Artificial intelligence is man-made intelligence but opposed to natural intelligence but its performance compared to humans is slightly better in it. Worldwide, this artificial intelligence is used in agriculture by activities like, forecasting, irrigation and weed management, fertilizer and crop protectants usage and harvesting [2]. Intervening of AI has reduced the farmer's work burden and time saving. It can offer a practical and effective solution to the farmers by using machine learning (ML) and deep learning (DL). Among them, machine learning provides knowledge to train large sets of data from publicly through clear ways to detect disease occurrence in plants from colossal charts. Remaining deep learning is a part of machine learning and it was composed with artificial neural networks representing the learning and reports obtained from various intervals such as supervised, semi-supervised and unsupervised. Totally, these approaches were based on utilizing the images and interrupted with artificial neural networks of assumption, prediction, evaluation and decision of finalized report [3].

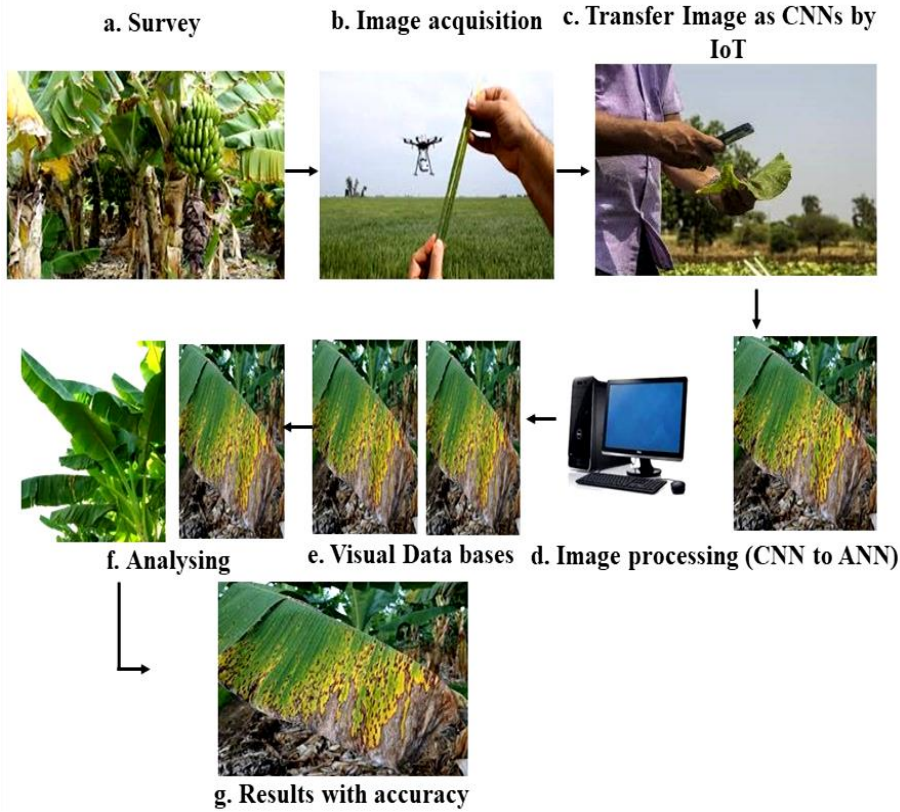
Workflow of AI in Plant Disease Diagnosis

1. Survey & Image Acquisition

A vast survey was conducted and several fields were selected and that field's based – infected crop images (healthy and infected) are collected at huge levels of numbers from particular crops.

2. Image Generation

Drone-based images are captured (>500 nos.), scanning of fields and more images generated in the form of MATLAB reads then transferred from that to joined PC *via*., internet of things (IOT) rapidly.



Application of AI in Crop Disease Diagnosis

3. Image Processing

It is an initial process, which is used to measure the affected area of disease in crops and find differences based on colour variation, infected plant parts and diameter of area. In this method, image pixels were processed (Image segmentation) and recognised by CNNs

(convolutional neural networks by forms such as image, audio, video). These CNNs were transmitted in the form of ANN (artificial neural networks) and it was compared with visual databases and analyzed their similarities and variations on visual via. Deep residues obtained at accuracy >97.8% then studied the variation and similarities of disease (Feature extraction).

4. Machine Learning (ML)

After the processed images were stored in the form of finite sequence of algorithmic numeral values with computational big data in a colossal way associated by application of deep learning methods. These machine learning algorithms are rapid and accurate to detect all diseases. The recognition rate has increased when employed on paper.

5. Deep Learning (DL)

It helps finding out a crucial relationship between the disease similarities, variations and complexities from collected big data on symptoms level and it might help to disease forecasting, pests' upsurge and be used for overcoming the incidences and avoid before its occurrence through well-defined accuracy with environment.

6. Expert System (ES)

Afterwards, an establishment is formed and called the 'expert system'. It is an integrated approach to help the farmers through decision making in sowing to harvest, time of irrigation, nutritional disorders, weed, disease and pest management on before and during cultivation -forecasting from a group of expert systems comprising agricultural scientists, computer engineers, farmers and government. This system organizes a relationship between farmers and growing science.

Applications of AI in Agriculture

Artificial intelligence recognizes and helps the farmers faster and accurately by their reports. By weather forecasting, organise and formation the irrigation schedules, fertilizers (nutritional disorders) and weed management (occurrence and growth monitoring), pest upsurge (irregular climatic factors delivery of reports early, disease incidence and management and harvesting schedule formation.

Future Scope

The Indian government expects our population to reach > 1.6 billion in 2030. With this huge growth in population one can expect massive demand for agricultural consumption as well. So, this advance

in population and demand created unusual consumption, farming communities' occupational transform and lack in skill-based workers flow out. These conditions, an alternative strategy is implementation of AI in agriculture in whole works *viz*., sowing to harvest with rapid timing and efficiently given better management for sustainable agriculture.

Conclusion

In agriculture, crop disease diagnosis and management are being shaking to the science, because of emerging diseases and their loss of production. Initial step of disease diagnosis is based on field visit, visualizing symptoms and sampling. Sometimes these approaches yielded negative results due to several reasons like crop nature, age of the crop, disease diversity of symptoms and abiotic factors. Application of artificial intelligence can provide better reports on disease diagnosis mostly based on comparison, image perfection and faster. Coming very soon, it will play a vital role in disease diagnosis and forecasting technologies for prevention of yield loss in production agriculture by their reporting.

This article is written by the authors: Murali Sankar P[1,] and Karthiba L[2], [1]Department of Plant Pathology, SRSIAT, Vedasandur – 624 710; [2]Department of Plant Pathology, TNAU, Coimbatore-641 003, India. The authors can be contacted at muralisankar58@gmail.com.*

CORROSION OF METALS AND ITS IMPACT ON ECONOMY

In structural and ornamental uses, metals and alloys are the most significant materials. Steel, in particular is a common fabrication material in industries like sugar, petrochemicals, food, paper, and textiles. Metal and alloy corrosion, degradation, and destruction are unavoidable but manageable processes. Corrosion has a huge impact on a country's growth, comparable to natural disasters such as earthquakes and floods. Every year, corrosion costs the global economy around Rs.344 billion (US$ 5000 billion).

Developing countries like India struggle to boost their GDP by a few decimal points year after year. Though no accurate study exists to indicate the actual amount of money lost owing to various types of corrosion, it is believed that roughly 4 to 6 percent of the Indian economy's GDP is lost to corrosion each year, amounting to about Rs. 4,00,000 crores. It is estimated that 20-30 percent of the loss, or Rs. 8,000–12,000 crores, can be prevented by implementing sound management practices and corrosion prevention measures.

Corrosion and its Impacts

Corrosion has an impact on our daily lives, both directly and indirectly. It reduces the useful and functionality of our goods directly. Corrosion expenses are borne indirectly by the manufacturer and provider of goods and services. Corrosion of reinforcing steel bars in concrete, in particular causes bridges to fall, portions of highways to fail, buildings and parking structures to be damaged, endangering public safety and requiring significant repair expenditures. For example, in 1967 the Silver Bridge over the Ohio River unexpectedly collapsed owing to corrosion fatigue, killing 46 people and costing millions of dollars. In order to estimate the cost of corrosion in the United States (US), CC Technologies Laboratories conducted a study titled "Corrosion Costs and Preventive Strategies in the United States" from 1999 to 2001 with the help of the Federal Highway Administration (FHWA) and the National Association of Corrosion Engineers (NACE). The average direct cost of corrosion for highway bridges was projected to be $8.3 billion per year according to the study conducted, while the

total corrosion cost of US industries was assessed to be $276 billion per year that is around 3.1 percent of the US Gross Domestic Product (GDP). As a result, from a safety and economic standpoint, steel reinforcement corrosion is a severe issue that can directly affect the long-term viability of steel-reinforced concrete structures.

Techniques for Estimation of Corrosion

For the safe maintenance and repair of steel reinforced concrete structures, appropriate monitoring and inspection procedures for evaluating steel reinforcement corrosion is required. These approaches will help to detect any potential structural durability issues before they become serious. Electrochemical methods are useful for studying corrosion processes because steel reinforcement corrosion is caused by electrochemical reactions involving charge electrons transfer via concrete pore solution. Some electrochemical and non-destructive techniques are used for monitoring steel corrosion in concrete structures. The destructive technique namely the gravimetric weight loss method as well as recent non-destructive method such as corrosion monitoring employing sensors is also used.

Non-Destructive Techniques for estimation of corrosion

Open circuit Potential

The measurement of steel reinforcement corrosion potential also known as half-cell potential or open circuit potential with regard to a standard reference electrode is the primary idea involved in this method (RE). The Open circuit Potential readings can only provide information on the degree of corrosion risk but cannot exactly provide the rate of corrosion.

Surface Potential Measurement

This the non-destructive way for determining the quality of steel embedded in concrete. Two reference electrodes are utilized in this procedure. One electrode is kept fixed called fixed electrode, while the other electrode called moveable electrode is moved along the structure. A high impedance voltmeter is used to measure the potential of the movable electrode against the fixed electrode when it is placed at the nodal points. A higher potential value indicates an anodic zone where corrosion may occur. Corrosion is more likely to be occurred when the potential difference between the anodic and cathodic zones is considerably higher.

Corrosion monitoring using sensors

The most recent advancements in the field of smart materials and systems have ushered in new possibilities for structural health monitoring and non-destructive testing. Smart materials, such as fibre optic materials and piezoelectric ceramic, have enabled online monitoring with higher resolution and faster reaction due to their extensive damage detection capabilities. Sensors based on PZT and optical fibres have recently been investigated for assessing corrosion in steel reinforced concrete constructions. There are several non-destructive methods such as Potentiodynamic and cyclic polarization, Linear polarization resistance, Electrochemical impedance spectroscopy, Galvanostatic pulse and Electrical resistivity measurement each of these methods has its merits and demerits. Out these methods few can be done in laboratories and few are verified using the standard equations and Galvanostatic method is the rapid non-destructive method for evaluating the corrosion in field.

Destructive Techniques for estimation of corrosion

Gravimetric weight loss measurement

This is the most popular destructive technique for evaluating steel reinforcement corrosion rates. Because the testing is simple to repeat, this is the most accurate and precise technique for estimating the corrosion rate of steel reinforced concrete systems. This is a basic strategy that decreases the likelihood of making methodical errors.

Conclusion

Even though there are several method techniques such as non-destructive and destructive for measurement of corrosion. The researchers who had their past researches have suggested that there are several merits and demerits in each technique. There are a variety of approaches for detecting, measuring and diagnosing corrosion in steel rebar, but there is no consensus on which technique accurately assesses the corrosion rate. As a result, it is advised that a combination of evaluation methods be used in order to obtain trustworthy information about the corrosion condition of steel embedded in concrete. The average corrosion rate derived from the various procedures can be used for future investigation.

This article is written by the authors: Monikandon Sukumaran[1], S. Poongothai[2] and N. Ravisankar[2], [1]College of Fisheries Engineering, Tamil Nadu Dr.J.Jayalalithaa Fisheries University, Nagapattinam, Tamil Nadu- 611 002.
[2]Department of Civil Engineering, Faculty of Engineering and Technology, Annamalai University, Chidambaram, Tamil Nadu- 608 002.

ARTICLE

BIODEGRADABLE FOOD PACKAGE MATERIAL- IDENTIFIED AS A SOLUTION FOR PACKAGED PLASTICS WASTE

Plastic is a flexible, lightweight, inexpensive and durable material that can be moulded in to different shapes and can be used in variety of applications. Plastics, unlike metals, do not rust or corrode. The majority of plastics photodegrade rather than biodegrade, which means they slowly, break down into tiny particles known as microplastics. Because of heavy UV irradiation and abrasion by waves, big plastic items commonly break into microplastics on land, such as beaches, whereas the degradation process is considerably higher. Single use plastics are also known as throwaway plastics that are commonly used for plastic packaging and comprise objects that are intended to be used once and then discarded or recycled. Grocery bags, food packaging, bottles, straws and containers are just few examples of them.

Rise of packing plastics

Ceramic, glass, wood, wicker and textiles have been the primary materials for storing and selling organic products and commodities for millennia, until the recent advent of plastics signalled the start of a new era. Food packaging and containers, which had previously been manufactured of conventional materials, began to be increasingly manufactured of plastic materials starting in the 1950s, allowing for better food preservation. The reasons that contributed for increase in usage of single use food packing plastics are, plastics are lighter than the conventional industrial materials that are used for packing of food, population growth and concentration and majority of plastic packaging materials are impermeable to food fluids such as blood, lipids and beverages and are hygienic to consumer society. The packaging industry accounts for roughly 40% of the demand for plastic materials in Europe. The reasons for preference of plastic packed food by the public are due to some advantages such as price of the package material, availability of choice of processed packaged food products, package food hygiene and lifestyle of people etc.

Plastics as an Ocean Pollutant

Plastic waste enters in to ocean from the land and 98 percent of the plastic waste comes from other countries outside of Europe and

United States. China, Indonesia, Philippines, Vietnam, Sri Lanka, Thailand, Egypt, Malaysia, Nigeria and Bangladesh are believed to be the major source of plastic leakage into the oceans, accounting for more than 80% of ocean debris. Majority of ocean discarded plastics are single use plastics. These plastics degrade in to microplastics and enter the intestine of bivalves, fishes, planktons, algaes and crustaceans thereby entering the food chain of humans. Due to the ocean microplastics and plastic pollution there is threat that is posed to the nutritional seafood and its safety.

Biodegradable food packing material – a solution

Researchers from Harvard T.H. Chan School of Public Health and Nanyang Technological University Singapore have developed a biodegradable food packaging material that inhibits harmful microorganisms and extends the shelf life of fresh fruit by two to three days. Having an antibacterial and biodegradable food packaging alternative could be extremely advantageous in terms of waste reduction and food safety. Containers and packaging constitute a large component of municipal solid waste, accounting for 82.2 million tonnes of generation in 2018, according to the US Environmental Protection Agency. Raw meat, fish, fruit, vegetables and ready to eat meals will take advantage of the latest packaging. The goal of Professor Mary Chan and his colleagues is to replace traditional plastic packaging with the new material, which will double product shelf life. The new plastic like food packaging is produced from zein, a corn protein, starch and other organically generated biopolymers and it is mixed with a mixture of natural antibacterial chemicals like thyme oil and citric acid.

The fibres in the packaging produce natural antimicrobial compounds when exposed to an increase in humidity or enzymes from harmful bacteria, eliminating typical dangerous germs that contaminate food, such as *E. coli*, Listeria or fungal. When additional humidity or bacteria are present, the packaging is engineered to release the necessary amount of antimicrobial chemicals. This guarantees that the package will withstand several exposures and persist for months. The chemicals have the potential to be utilised for a wide range of items, including ready to eat foods, raw meat, fruits and vegetables, because they target bacteria that develop on the surface of the container as well as on the food product itself.

The wastage of vegetables will continue because respire even while refrigerated, resulting in deterioration within a week or two. The biodegradable and antimicrobial packaging has the potential to improve the shelf life of vegetables and fruits while also making them seem fresh

over time. According to the researchers, strawberries wrapped in the packaging stayed fresh for seven days before growing mould, compared to strawberries housed in conventional fruit plastic boxes, which only lasted four days. According to Professor Chan, the biodegradable and antibacterial packing material will be around 50% more expensive than standard plastic packaging.

Conclusion

People in society are fully aware of the impact of plastics on the environment and their entry into the oceans and aquatic ecosystem. Recent studies by European experts have advised that instead of single use plastics, the industry should employ recyclable packaging polymers. Furthermore, steps should be taken to decrease the environmental impact of package plastics. To alleviate the negative consequences of single use packaging plastics, more research into the potential use of packaging plastics and alternative packaging materials is required. Now all the questions by the past researches on alternative packing material or recycle packing materials and cost effective material to wrap the products such as food, beverages, medications and cosmetics etc are answered by this biodegradable and antibacterial novel packing materials. Companies should consider employing the newly invented biodegradable and antibacterial novel packing material to extent the shelf life of their products. Further more research is needed to make the material cost effective.

This article is written by the authors: Monikandon Sukumaran[1], S. Poongothai[2] and N. Ravisankar[2], [1]College of Fisheries Engineering, Tamil Nadu Dr.J.Jayalalithaa Fisheries University, Nagapattinam, Tamil Nadu- 611 002. [2]Department of Civil Engineering, Faculty of Engineering and Technology, Annamalai University, Chidambaram, Tamil Nadu- 608 002.

States of the human brain between wakefulness and sleep

1. Unconsciousness: An oxygen deprivation usually makes people lose consciousness after about 30 to 180 seconds, but their bodies can be trained to keep going for a long time. A Spaniard multiple World Champion freediver, Aleix Segura, once held his breath for more than 24 minutes.

2.Locked-in syndrome: It's a very rare condition in which a person is still alive and can think and reason, but they can't move any of their muscles except the ones that move their eyes. stroke, brain infection, bleeding and tumours can all cause near-total paralysis. An overdose or a stroke can also cause it.

3. Vegetative state: The person is awake, but he or she doesn't know who they are or where they are, or how to think. The eyes may sometimes be open, and some basic reflexes may still be in good shape.

4. Coma: An underlying sickness or a head injury may result in a protracted state of unconsciousness, which can be caused by a stroke, a brain tumour, intoxication with drugs or alcohol, or by a brain injury. It seldom lasts for more than a few weeks at a time.

5. Brain death: According to legal definitions, death is defined as "the absence of all neurologic function" over a period of time. There is no way to undo this full stoppage of all brain functioning. The loss of brain function is irreversible.

Maida, Parota, and Diabetes – Think Before You Eat

It is no exaggeration to say that 'parotta' has become a household name among South Indian hotels. It comes in a variety of shapes and sizes, including kothu parotta, egg-spread 'egg parotta,' oil-fried 'Virudhunagar parota,' and a gigantic size 'Malabar parota,' to name a few. With the addition of a new type called as 'Sri Lanka parotta,' it seems to have gone worldwide. Parotta is now accessible everywhere from a little store to a five-star hotel.

Parotta is the one common word in the dictionaries of all waiters in any hotel, from the platform to the Star hotel. Waiters would say this term ‘parotta’ to customers without giving it a second thought. People, no matter how old they are, are always tempted to eat parotta, and this has become more and more common. However, it is very important for us to know how parotta is made from maida flour and why maida is so bad for our health.

Maida is used a lot in cakes, naan, biscuits, breads, breakfast among others. In this case, the wheat is beaten and the micro nutrients are removed. Because of commercial needs, the wheat is bleached artificially to make it look as white as possible. There are two parts to a wheat grain: the bran and the endosperm. Maida is made from the inside of the wheat grain. This part is ground up and made white with benzoyl peroxide. This is then mixed with alloxan (a chemical) to make maida, which is a flour. When maida goes through this process, it gets very soft. To make it look better and more appealing, these chemicals are being used when flour is being made. On the other hand, it is also said that alloxan is a by-product that comes out of this bleaching process.

A dedicated research in 2017 has found the presence of alloxan in bakery products (DOI:10.1016/j.jcs.2017.06.015). Alloxan is a chemical that is used to make animals diabetic for research. It has a bad effect on pancreatic beta cells, which causes problems with insulin production and leads to diabetes, so it's not good for you. Alloxan, on the other hand, is a very unstable molecule. When it gets reduced to dialuric acid, it releases free radicals like hydrogen peroxide, which could damage the inside of the cell. These radicals were found to be

the cause of the death of pancreatic beta cells, which led to insulin-dependent diabetes. Recent research from Tamil Nadu has revealed these connections between alloxan and diabetes DOI: 10.1007/s11030-020-10075-5).

Diabetes mellitus is a long-term metabolic disorder characterized by an imbalance between blood glucose levels and insulin production in our body. According to statistics, there were 425 million individuals living with diabetes in 2017; this figure is expected to rise to 629 million by 2045.

Type 2-diabetes is the most frequent of them, accounting for 95 percent of all cases. Insulin signalling pathways that are dysregulated in both type 1 and type 2 diabetes have been identified as a roadblock in the pathophysiology of diabetic central nervous system. Epidemiological studies show that Type 2 diabetes is a substantial risk factor for various neurological disorders, such as Alzheimer's disease, and that Type 2 diabetes and Alzheimer's disease have a strong link. Within the islets of Langerhans, neuronal cells play a role in glucose metabolism, hence controlling blood glucose levels. Insulin production is reduced when pancreatic beta cells are lost.

OPPORTUNITIES IN R&D

Senior Scientist I, Sterile Liquid Product Development, Irvine, United States of America

Senior Scientist I, Medicinal Chemistry, South San Francisco, United States of America

Head / Assistant Head (Governance, Risk, and Compliance Specialist), Singapore

Research Fellow (Nutrition) SIFBI, Singapore

Research Fellow, Discovery CG (SIFBI), Singapore

Research Office – Scientific Editor/Writer, Singapore

Scientist (Fungal Engineering) SIFBI, Singapore

Scientist (Chiplets Advanced Packaging), IME, Singapore

Scientist, Strain Engineering (SIFBI), Singapore

Scientist(SG MAP) SIFBI, Singapore

Assistant Head / Senior Officer (MedTech), Biomedical Research Council, Singapore

Research Fellow (Data Scientist) (Shared Analytics Platform), SIFBI, Singapore

Assistant Head (People Development & Planning Office), Biomedical Research Council, Singapore

Director, Oriental Institute Research Center in Taiwan

Electrical and Electronic Engineering / Professor or Associate Professor / Yamaguchi University(Female only), Japan

Aspirants shall click on the link encrypted with the above positions and very its reliability. TRSM is not responsible for content given in the third party website in those links.

Chemical Science Review and Letters

NAAS rating of 4.75 for 2022

An International Interdisciplinary Journal to further Chemical Sciences

| NAAS Rating 4.75 | International Chemistry Journal | E Journal of Chemistry | Biochemistry | Agricultural Chemistry Journal | Soil, Nutrition, Food Science |

Chemical Science Review and Letters (ISSN 2278-6783) is an international chemistry journal that publishes interdisciplinary research related to chemistry/chemical science. This e-journal entered into 11th year of service since its inception in 2012. As a peer-reviewed international chemistry journal, it aims at rapid publication of quality chemistry research and review articles. This open access journal is devoted to short communications/letters, full-length research articles, as well as review articles in the fundamental and applied research areas related to chemical, materials science, agricultural science and engineering. Chemical Science Review and Letters has **NAAS rating of 4.75 for 2022** and Scientific Journal Impact Factor of 6.972 for 2018. The journal has a Index Copernicus Value, ICV 52.224 for the year 2015. The journal has been continuously indexed and rated by NAAS for the past five years since 2017. NAAS Score: 4.75 for 2022 | 4.75 for 2021 | 5.21 for 2020 | 5.21 for 2019 | 5.21 for 2018 | 5.21 for 2017.

Abstracting and Indexing: NAAS, Chemical Abstract Service (CAS, SciFinder, A division of the American Chemical Society), Directory of Open Access Journals (DOAJ), National Digital Library (NDL, India), Electronic Journals Library (EZB), Directory of Research Journals Indexing (DRJI), Scientific Journal Impact Factor (SJIF), Directory of Science, CiteFactor, Exlibris PRimo Central, MIAR of University of Barcelona, Findit, BASE, The University of Hong Kong Libraries, Microsoft's Academic Search, Google Scholar, International Directory of Agriculture, Food, and the Environment, UGC Approved Journal (No.45864, 2017-2018).