



SCIENTIFIC RAVI 2022

"SMALL CHANGES, BIG IMPACT: PROTECTING OUR ENVIRONMENT STARTS WITH YOU."

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The Science Ravi 2022

Government College University, Lahore

VOL. XXXI



Estd. 1864

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VICE CHANCELLOR'S NOTE



Despite changing times, "Scientific Ravi" has remained a source of pride for our university, showcasing cutting-edge research and innovative ideas produced by our faculty and students. The publication serves as a platform for our researchers to share their work with a wider audience, in a language engaging the vibrant community of scholars and experts in their fields.

As the head of this prestigious institution, I am committed to supporting and promoting the highest standards of academic excellence and research. The "Scientific Ravi" is a testament to our commitment to fostering a culture of research and discovery, and to encourage the next generation of scholars to pursue their passions and interests in science and technology.

In today's rapidly advancing world, scientific knowledge for us is more crucial than ever. Scientific advancements have the power to shape our lives and solve global issues.
Scientific knowledge is particularly important for the development of new technology, and medicines, the improvement of agriculture, and a better understanding of our natural environment. It is the need of the hour to invest in scientific research and education to ensure that future generations have the tools and knowledge they need to create a better world. "Scientific Ravi" provides an important platform for the exchange of scientific knowledge and ideas and serves as a valuable resource for those who are interested in exploring the latest advancements in science and technology.

The publication of "Scientific Ravi" also reflects our university's commitment to transparency, responsibility, and the dissemination of information to the public. The articles in this magazine will provide a valuable resource for graduates, the public, and policymakers, and will contribute to the ongoing dialogue about the role of science in society.

I extend my heartfelt gratitude to the editorial board and the faculty members who have contributed to this edition of "Scientific Ravi." Your hard work and dedication have ensured that this magazine will continue to be a source of inspiration for all its readers.

Finally, I am confident that this edition of "Scientific Ravi" will be well received by the academic community and will serve as a source of pride for our university. I encourage you to take a moment to peruse its contents and to share your thoughts and ideas with others. I also encourage all members of our academic community to embrace the opportunities that "Scientific Ravi" provides, and to contribute to its continued success and growth.

My best wishes,

Prof. Dr. Syed Asghar Zaidi (*T.I*)

Vice Chancellor, Government College University Lahore

EDITORIAL



The sciences have always been a revered component of Government College University's academic offerings. As students of the pure sciences, it is our duty to critically examine the truths of the universe and delve into the discoveries made. By staying current with the latest scientific advancements, we can better understand the complexities of our world and develop solutions to its most pressing challenges. Every triumph in this quest represents a valiant effort to piece together the massive puzzle of nature that has been presented to us. Scientific pioneers who have faced the challenges of exploring the universe have been celebrated for their bravery. Scientific knowledge empowers humanity to shape nature and advance society, allowing us to make technological advancements, cure diseases, and explore space.

In the words of Omar Nelson Bradley,

"We need to learn to set our course by the stars, not by the lights of every passing ship."

Scientific Ravi has always served as a beacon for young, inquisitive scientists entering this storied institution, and it is our goal to continue this legacy with this latest issue of the magazine, made possible by the tireless work of the editorial board. In this edition of Scientific Ravi, we are proud to feature contributions from researchers, and entrepreneurs as well as from our talented student body and editorial board. These articles delve into a range of scientific topics, exploring the latest research and developments in a variety of fields.

I extend my gratitude to the managing editor, Dr. Aziz-ur-Rehman, and my entire editorial board for their tireless and unwavering efforts in bringing this magazine to fruition. Your passion for science and your commitment to sharing its knowledge with the world inspire us all. I hope that readers will find this edition both engaging and educational, and take away valuable insights and knowledge.

"The magazine is dedicated to those impacted by floods in Pakistan, and the resilience and strength of the affected communities are an inspiration. The tragedy serves as a reminder of the urgent need for action to mitigate the impact of global warming, and we hope that this edition provides valuable information on the science behind this crisis, and the solutions we can all implement to create a more sustainable future for generations to come."

Maria Siddique
Editor,
The Scientific Ravi 2022

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A 20 YEAROLD YOUNG RAVIAN TRANSFORMING PEOPLE'S LIFE AND BUSINESS



"Nestled amidst the bustling streets of Lahore lies a gem of an institute, the Government College University. To be a Ravian, the proud alumni of this esteemed university is to bask in a legacy of excellence, determination, and unwavering spirit. With a rich history dating back over a century, the GCU has produced countless leaders, thinkers, andvisionaries who have made their mark on the world. And as a Ravian, one can never forget the memories, the friendships, and the values that have been imparted during their time at this remarkable institution."

Yousaf Ijaz Munawar is a 20-year-old emerging star of the Ravian galaxy! student of the Computer Sciences Department and a Neuro-linguistic Programming (NLP) certified trainer. He is the CEO and , Founder of YOUSAF MUNAWAR TRAININGS working as a corporate success trainer, NLP trainer & coach from the platform of Business Incubation Center (BIC) GCUL. As a practitioner of Neuro-Linguistic Programming, he has utilized one of the most contemporary and well-regarded sciences of mind programming to aid individuals and companies in their personal and professional development. He has worked with over 100 clients, including survivors of trauma, corporate professionals, sales teams, homemakers, and students, to help them overcome their past struggles and achieve success. His coaching has been instrumental in allowing these individuals to make progress in their lives and has helped companies to increase their sales and improve their management skills, leading to their growth and success. India was added to the list of countries he served, as clients from there, were impressed with his expertise and professionalism.



Yousuf has been working in the field of mind programming for the last three years, after getting training from numerous national and international trainers regarding NLP, CBT, Hypnosis, Hypnotherapy, Leadership, People management, Self-development Theories, Relationship Conflicts, Emotional Well-being, & Emotional Intelligence. Recently he launched a module "ERASING PAINFUL PSAT MEMORIES WITHIN 30 MINUTES" which surprisingly helped the attendees in getting out of their traumatic memories. His website serves as the gateway to the module, where one can access its full range of features and benefits.

Yousuf is dedicated to supporting the students of GCU, helping them to tackle the challenges of life and attain their desired life outcomes. He encourages taking responsibility for one's own life and investing time, effort, and energy into personal improvement. To further his mission, he offers insights and advice through his YouTube channel, where students can access videos on topics such as persuasion, and performance.



INTERMEDIATE

Fintech in Pakistan:
Leveraging Technology for
Financial Stability and Growth

Muhammad Ali
(Class: XII (GSC) 'B4' (1242-1-21))

Financial technology, also known as fintech, is a rapidly growing industry that has revolutionized the way financial services are provided. It encompasses a wide range of technologies and innovations that have transformed traditional financial services such as banking, payments, and financial planning. In Pakistan, fintech has become increasingly important in recent years as the country looks to modernize its financial sector and promote economic stability.

One of the main benefits of fintech in Pakistan is its ability to increase financial inclusion. According to the World Bank, only about 30% of the adult population in Pakistan has a bank account. This lack of access to formal financial institutions can be due to various reasons, such as lack of identification documents, distance from a bank branch, or lack of trust in the financial system. Fintech provides an alternative to traditional banking, allowing individuals to access financial services through their phones or computers. For example, mobile money platforms such as Easypaisa and Jazz Cash allow individuals to make and receive payments, save money, and even take out loans without the need for a bank account. This not only allows more people to participate in the formal financial sector but also allows them to build a financial history, which can be beneficial for future credit applications.

Fintech can also help improve the efficiency and speed of financial transactions in Pakistan. Traditional financial systems can often be slow and cumbersome, with long wait times for transactions to be processed. Fintech platforms, on the other hand, use advanced technology such as blockchain to facilitate faster and more secure transactions. This can not only save time for individuals and businesses, but it can also reduce the risk of errors and fraud.

Additionally, fintech can make it easier for individuals and businesses to access financial services and information, as many platforms have user-friendly interfaces and offer a range of services in one place.

Another benefit of fintech in Pakistan is its potential to support small and medium-sized enterprises (SMEs). SMEs play a crucial role in Pakistan's economy, accounting for about 90% of the country's employment. However, these businesses often face challenges in accessing financing, as traditional banks may require collateral and lengthy application processes. Fintech platforms, on the other hand, can provide quick and easy access to financing for SMEs through online lending platforms and crowdfunding campaigns. This can not only help these businesses grow, but it can also create more jobs and stimulate economic growth.

Fintech can also help improve financial literacy and education in Pakistan. Many people, particularly in rural areas, may not have access to financial education and may not understand the importance of saving and investing. Fintech platforms can provide educational resources and tools that can help individuals make informed financial decisions. For example, investment platforms such as Bramerz and Invest2Innovate offer educational materials and tools to help individuals understand the different investment options available to them.

Finally, fintech can help promote financial stability in Pakistan. A stable financial system is essential for a healthy economy, as it allows individuals and businesses to access financing, make payments, and plan for the future. Fintech can contribute to financial stability in several ways. First, it can help reduce the risk of fraud and errors by using advanced technology such as blockchain to secure transactions. Second, it can promote financial inclusion by providing alternative financial services to those who may not have access to traditional banking. And finally, it can help improve financial literacy, which can help individuals and businesses make informed financial decisions and avoid financial pitfalls.

Despite the many benefits of fintech in Pakistan, some challenges need to be addressed. One of the major challenges of fintech in Pakistan is the lack of a regulatory framework. As fintech is a relatively new concept, the government has not yet developed a comprehensive set of laws and regulations to govern the industry. This lack of clarity can lead to uncertainty and confusion for

both fintech companies and consumers, and can also create an environment that is ripe for fraud and abuse. To promote the growth of fintech in Pakistan and protect consumers, the government must develop a clear and consistent regulatory framework that promotes transparency and accountability.

Another challenge of fintech in Pakistan is the limited access to financial services for many citizens. While fintech has the potential to expand access to financial services, particularly for those living in rural or remote areas, the reality is that many people still do not have access to basic financial products and services. This is due to a variety of factors, including limited infrastructure, low levels of financial literacy, and the lack of available options. To be truly benefited from fintech, it is necessary to address these underlying issues and ensure that all citizens have access to the financial services they need.

A third challenge of fintech in Pakistan is the potential for security breaches and data privacy violations. As more and more financial transactions are conducted online, there is an increased risk of cyber-attacks and identity theft. This is especially concerning in a country like Pakistan, where there is a relatively high level of cybercrime. To address this issue, it is necessary for fintech companies to implement strong security measures and for the government to develop policies and regulations to protect consumers.

In conclusion, fintech is an increasingly important industry in Pakistan, with the potential to bring significant benefits to the country's economy. It has increased financial inclusion, supported SMEs, and improved the efficiency of the financial sector. While there are challenges that need to be addressed, such as regulatory clarity and cybersecurity concerns, the potential benefits of fintech are significant. By embracing fintech and addressing these challenges, Pakistan can create a more stable and prosperous economy for all its citizens.

Eco Capitalism and Climate Crisis
Eco Capitalism
Muhammad Mekaal Mirza
Class: D1 (Second Year)

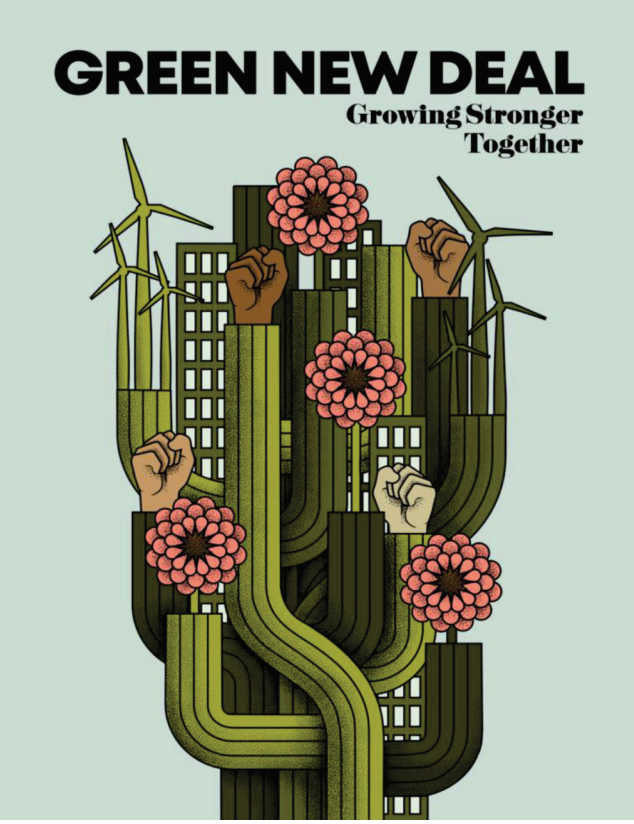
The struggle for the existence of human beings in the modern capitalist world and the conservation of environmental resources are two significant crises faced by the modern world. The philosophy of Eco Capitalism comes to the rescue which ensures the use of "natural resources" to generate capital for society and at the same time conserve the environment. This is another form of capitalism that ensures the compatibility of surviving with free market trade and the effective utilization of natural resources.



Role of Government

Government policies also play an effective role in promoting green capitalism. Governments are responsible for running the affairs of the country which requires capital generation but the methods of generating capital through industrialization cause major climate changes including the melting of snow caps, volcanic eruptions, formation of ozone holes and cancer in humans, and damage to aquatic life unless these methods of industrialization are kept in check by eco-friendly policies of the government. That's where the phenomenon of green capitalism or Eco Capitalism becomes essential for us. Government should introduce eco-friendly policies for the development of the economy and the sustainability of the environment. Let’s take a good example of the Swedish Government being the first one to introduce carbon emission taxes of US196$ per metric ton of carbon dioxide which rapidly controlled the industrialization and carbon emissions in the country while at the same time

practicing a healthy social democracy through Eco Capitalism. One another method that can be practiced by the government is to make laws against overfishing to allow stocks to replenish for future fishing.



Major Climate Hazards

Some major climate crises across the world include;

- Food shortage problems have significant measures in developing countries like Pakistan, Sri Lanka, India, and Ethiopia where people are suffering from malnutrition and food shortage problems because of overpopulation and capitalistic structures in terms of privatization of public resources.
- The rising level of carbon indicators across the globe due to excessive industrialization by capitalist (developed) countries causing a major hazard to the global environment. According to certain reports the USA has produced over 400 billion metric tons of Carbon dioxide since 1751 and has been responsible for 25% of historic emissions.
- COVID-19 which struck the map of the world and caused the death of over 7.5 million people is the greatest threat to humanity and the environment. According to recent reports by WHO, several new cases of the "Third Wave" of COVID-19 have been reported in China which is much more severe and a threat to humanity.

Scientific Methods

Some effective scientific methods to conserve the environment by Eco Capitalism are;

- Use of recombinant DNA technology to produce genetically modified plants and crops to overcome the food shortage crisis across the globe. Scientists have developed plants that can fix nitrogen directly from the air. Government should promote the use of such plants to eliminate fertilizers which are an environmental hazard and these crops can increase the exports of a country bringing in foreign exchange and prosperity which is the motive of Eco Capitalism.
- Specialized Catalytic converters and chemicals should be used to eliminate chlorofluorocarbon emission and carbon dioxide emissions and the government should adopt policies to control environmental hazards by following the motion of the "Paris Treaty" for the conversation of the environment.
- "COVAX" program by WHO is a major initiative of global unity to fight against this pandemic in which several nations like Japan, the USA, and China have come forward to collaborate for the provision of vaccines across the developed and developing nations through scientific research and county policies which is a major initiative of United Nations for humanity.

Starlink system of SpaceX
Ali Rasheed
(0726-1-22-F2) pre-engineering

Introduction to Starlink:

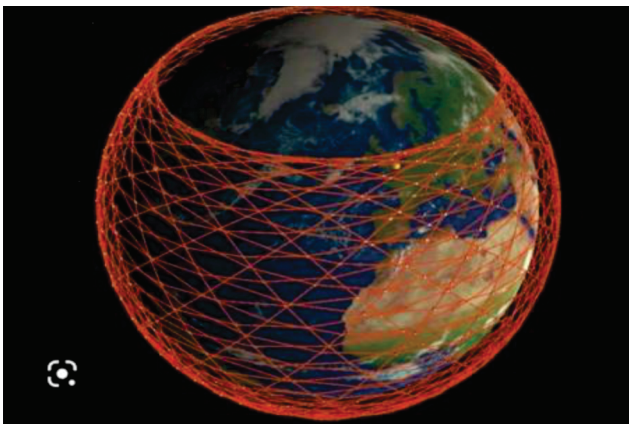
Starlink is a satellite Internet service designed and operated by **SpaceX, USA**, a company founded by **Elon Musk** in **2002.** SpaceX started launching

Starlink satellites in **2019.** Now, Starlink is a major Internet provider consisting of more than 2,000 satellites. These satellites are connected to thousands of terminals on earth. It played a key role when Internet services were disturbed in Ukraine, due to war, in February 2022.



How Starlink works?

The satellite constellation project Starlink is placing thousands of satellites in **low earth orbits(LEO),** approximately **550 Km** above us. These satellites will beam Internet signals to the ground transceivers, which intern will broadcast locally or through the wire to the Internet router at one's doorstep. This Internet is capable of supporting streaming, online games, video calls, and more.



Starlink VS WiFi:

Both are gaining popularity as groundbreaking networks, but both work in different ways. However, the signals of Starlink have more maximum and median speed than any other satellite or fiber internet system.

Speed of Starlink:

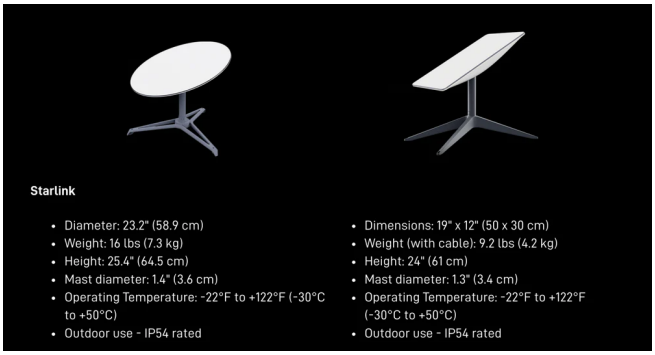
Starlink internet can offer a speed of around **50-200 Mbps**.

Cost and lifespan of Starlink satellite internet:

Starlink costs **110 dollars per month**, with an initial setup cost of **600 dollars**. The lifespan of these satellites is projected to be **5 years** and the design of the new satellite being launched is improved with each successive deployment.

Setup:

Like in other satellite internet systems, Starlink also requires a **dish.** Satellites Internet signals from space to earth. Dishes are required to receive these signals, at ground level.



Significance of starlink Internet:

Starlink is extremely important in areas where Fiber optics or cable internet can not reach. It has been very advantageous for Internet Supply in Ukraine during the war, similarly, we can use Starlink to connect the Internet with disputed areas like Palestine and Kashmir. **Starlink Intelligent automation** is powering enterprises developing advanced technologies powered by AI. This aims in increasing production rates and decrease expenses, to deliver better service to customers.

Conclusion:

With the help of robotics, process automation, AI, and advanced analytics, the Starlink IA system can help organizations enroll in new possibilities. Early adopters are already reaping great benefits. Moreover, nearly we shall see developed companies, agencies, and sectors using the Starlink Internet and it would not be late before it is going to be public in every corner of the world as it is becoming common day by day in the USA and other developed countries.

Who owns Android?
Ali Rasheed
(0726-1-22-F2) pre-engineering

Android is a smart high technology smartphone operating system. It is designed by Google and is used by different smartphone companies. Surprisingly this OS is operating 70% of smartphones. It's also running TVs now. Android provides a rich application framework that allows manufacturers to design apps and games using java language. The Word Android itself means a robot resembling humans.

Android as a core is an open source. This means anyone from anywhere can make Android for their own, so as Google is the owner of Android makes 0 profit on Android, that's why they are adding services in our Android which collect user data and laser targets users with ads.

For this problem we have "Micro G". It is a fake random anonymous ID for your phone which registers your device as a certified google device, but its activity can't be traced and google can't get your information for spyware or no data breach can be a direct threat to a user, provided that you have Micro G getting hacked is a very difficult job.

It is one of the topics we should be well known before using an internet device. What are we being spelled for that device? Some sellers can make their devices so cheap that their business model is unsustainable, but on the dark side, they are collecting your data to target you with ads and make money in the long run. If you use Micro G you will save more battery, since all the google snooping apps will be off. An 11% battery gain is noticed in light mode. The next era is digital and might be dangerous for us.

For this problem we have "Micro G". It is a fake random anonymous ID for your phone which registers your device as a certified google device, but its activity can't be traced and google can't get your information for spyware or no data breach can be a direct threat to a user, provided that you have Micro G getting hacked is a very difficult job.

The Cambridge Analytica Scandal:
A Wake-Up Call for Cybersecurity

Cybersecurity is a critical issue that has garnered increasing attention in recent years, particularly with the proliferation of the internet and the increasing reliance on technology in everyday life. This is exemplified by high-profile incidents such as the Cambridge Analytica scandal, which highlighted the potential for malicious actors to exploit personal data and manipulate public opinion.
To begin with, it is important to understand the wider context of cyber security. The internet has become an integral part of our daily lives, and as a result, we are increasingly reliant on it for everything from communication to banking to shopping. However, this increased dependence on the internet has also made us more vulnerable to cyber threats, such as viruses, malware, and data breaches. These threats can have serious consequences, including financial loss, identity theft, and even national security risks.

One of the key challenges of cyber security is the constantly evolving nature of the threats. Hackers are becoming increasingly sophisticated in their tactics, and new technologies, such as the Internet of Things (IoT), have created new vulnerabilities. In addition, the rise of social media has made it easier for hackers to gather personal information about their targets, which can be used for a variety of nefarious purposes.
Against this backdrop, the Cambridge Analytica scandal brought the issue of data privacy to the forefront of public consciousness. In March 2018, it was revealed that the political consulting firm had obtained the personal data of 87 million Facebook users through a third-party app. The data was then allegedly used to target political advertising and potentially influence the outcome of the 2016 US presidential election.

Let's delve further into the case of the Cambridge Analytica scandal. Cambridge Analytica was a

political consulting firm that used data mining and psychological profiling to influence electoral campaigns. The company was founded in 2013 and became well-known for its involvement in the 2016 US presidential election, in which it worked for the Trump campaign. Cambridge Analytica gained notoriety for its use of data to target individuals with personalized political advertisements, which many believe helped sway the outcome of the election.

The company was able to obtain large amounts of data through several methods. One method was through the use of third-party data brokers, who collect and sell data from a variety of sources. Cambridge Analytica purchased data from these brokers to build extensive profiles on individuals, which included information on their interests, behaviors, and political beliefs.

In addition to third-party data brokers, Cambridge Analytica also used online quizzes and personality tests to gather data from individuals who voluntarily participated. These quizzes were promoted on social media platforms and promised to provide users with personalized insights, but in reality, they were used to collect data on users' interests, beliefs, and behaviors. This data was then used to target individuals with personalized political advertisements.

Finally, Cambridge Analytica used data scraping techniques to gather data from public profiles on social media platforms. This allowed them to collect data on individuals' likes, comments, and other activities on social media, which was used to build profiles on them and target them with personalized ads.

The Cambridge Analytica scandal was particularly concerning because it highlighted the potential for data to be used for political purposes without the knowledge or consent of the users. It also raised questions about the role of social media platforms in protecting user data, as Facebook was criticized for not doing enough to prevent the breach.

The fallout from the Cambridge Analytica scandal has been significant. The company has faced multiple investigations and lawsuits, and Facebook CEO Mark Zuckerberg testified before Congress about the incident. The scandal has also contributed to a broader conversation about data privacy and the need for stronger regulations to protect user data.

One of the key ways to improve cyber security and data privacy is through better education and awareness. One way for individuals to protect themselves from cyber security breaches is to use strong, complex passwords and change them regularly. This makes it more difficult for hackers to guess or crack your password and gain access to your accounts. Another effective measure is to enable two-factor authentication, which requires an additional code or token to be entered in addition to your password when logging in. This adds an extra layer of security and makes it harder for unauthorized users to access your accounts.

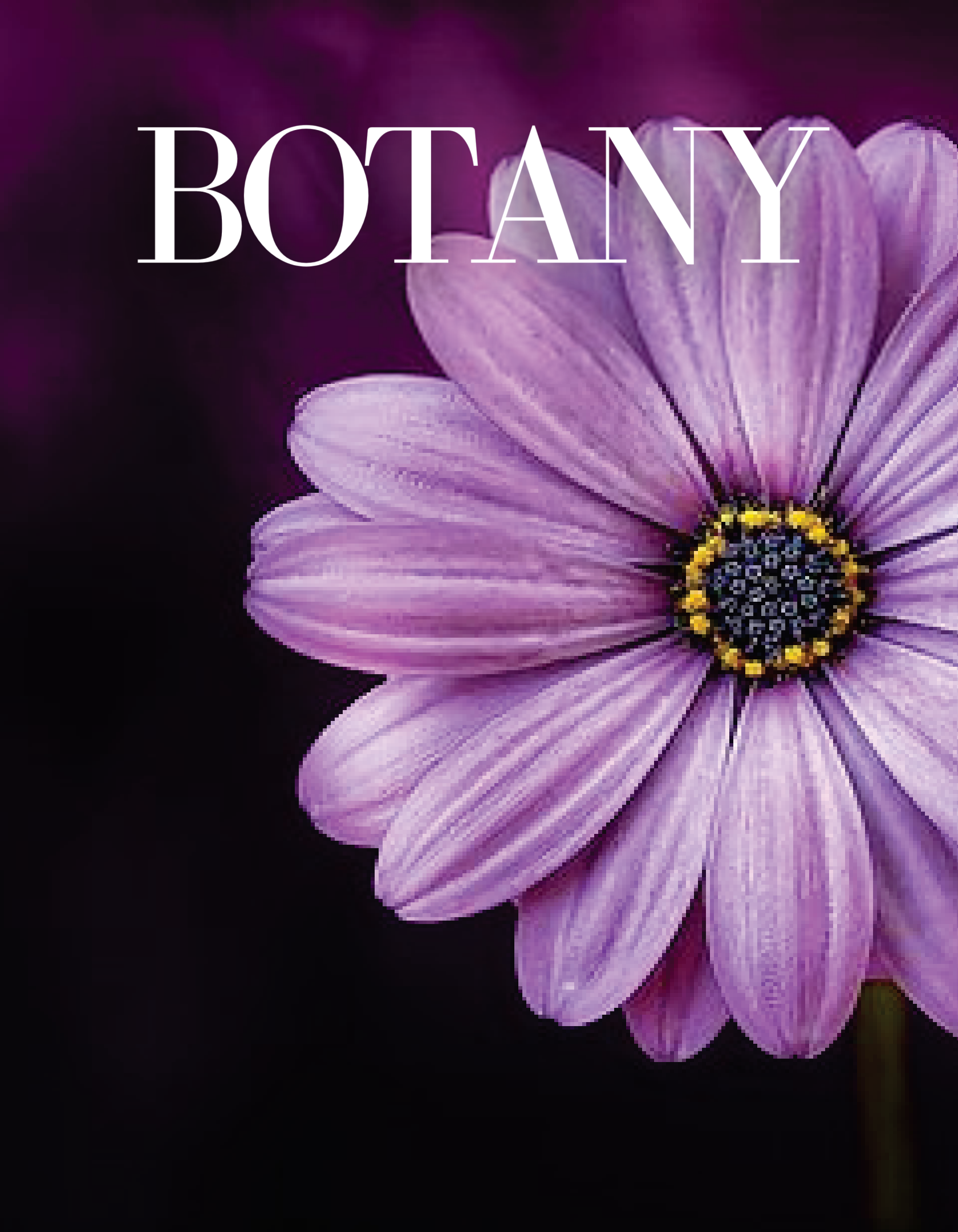
In addition to individual efforts to protect personal data, it is also important for companies and organizations to prioritize cybersecurity. This includes implementing robust security measures to protect against cyber-attacks and regularly updating software to address vulnerabilities. It is also important for companies to be transparent about their data collection and use practices, and to provide clear information to users about how their data will be used.

At the national level, governments can play a role in protecting against cyber security breaches by implementing laws and regulations that ensure companies are held accountable for protecting user data. Educating the public about cyber security best practices can also help prevent breaches, as well as investing in research and development to improve cyber security technologies. Working with international partners to address global cyber security threats is also important, as well as establishing a national cyber security agency to coordinate efforts and respond to incidents.

Another important aspect of cybersecurity is the need for international cooperation to address the issue. Cyber-attacks can have a global impact, and it is therefore important for countries to work together to prevent and mitigate the threats posed by cybercriminals. This includes sharing information about potential threats and collaborating on efforts to identify and prosecute those responsible for cyber-attacks.

Overall, the Cambridge Analytica scandal serves as a cautionary tale about the importance of cybersecurity and the need to protect personal data. It highlights the potential for technology to be exploited for nefarious purposes and the need for individuals and organizations to take steps to protect themselves. By prioritizing cybersecurity and being mindful of how personal data can be collected and used, it is possible to mitigate the risks posed by cyber-attacks and protect against the exploitation of technology.

BOTANY



TIMELINE

January, 2022

In January 2022, *Uvariopsis dicaprio*, an evergreen tree was found in Cameroon's Ebo forest. It reaches up to 13 feet and has glossy, yellow-green leaves growing in bunches along its trunk. Researchers credited DiCaprio's activism with helping save the tropical Ebo Forest and named the tree after his name. Fewer than 50 individuals were found in the forest thus making it a highly endangered species.

February, 2022

Researchers at Brigham Young University (BYU) discovered the locations of cacao groves that were sacred to the ancient Maya. Working closely with archaeologists from the U.S. and Mexico, the team found evidence of cacao groves in sinkholes in the Yucatan Peninsula. These skinholes may have created perfect microclimate for growing cacao trees by providing ideal levels of humidity stillness and shade in dry climate of Yucatan Peninsula thus making this discovery significant.

March, 2022

Carpotroche caceresiae, is a tree discovered in the rainforests of Nicaragua and Honduras. The species was named in honor of Indigenous Honduran environmental activist Berta Caceres, who was assassinated in 2016 by gunmen connected to a hydroelectric project that Caceres had opposed. This new species, which produces a green fruit, had previously been mistaken for its relative, *Carpotroche platypteraby*, which produces a red fruit.

April, 2022

In a recent study published in the *International Journal of Plant Sciences,* scientists excavating the fossilized remains of plant material wedged between layers of volcanic rock described a new plant species based on presence of distinctive fruit capsule that may be the oldest fruit discovered to the date of Spurge family (Euphorbiaceae).

May, 2022

Chinese scientists used data from Magnolia plastid genomes to peer back millions of years to understand Cenozoic climatic changes.

June, 2022

The paper published in iScience suggests that botanists should try to identify how the leaves create the iridoids after Reiko Uenoyama and colleagues noticed that silver vine leaves crumpled and torn by feline licking and chewing appeared to have a much stronger aromatic odor than intact leaves.

July, 2022

Botanists suggested that the frilly lip of the white egret orchid evolved as a stabilizer for the Hawk moth while it pollinates the plant, resulting in better seed production. The wild orchid *Habenaria radiata's* pure white petals resemble a white egret in flight and loved by people since ancient times but the adaptive significance of the flower's characteristic jagged shape has been unclear until now.

August, 2022

What happens below-ground in a corn field is easy to overlook, but it was found that corn root architecture can play an important role in water and nutrient acquisition, affecting drought tolerance, water use efficiency, and sustainability. Researchers concluded that, if breeders could encourage corn roots to grow down at a steeper angle, the crop could potentially access important resources deeper in the soil.

September, 2022

Over the past decades, rising levels of ozone pollution have been interrupting pollination, impacting the livelihood of both plants and the animals that pollinate them. Researchers now explain how an excess of ground-level ozone can damage plant foliage, change plants' flowering patterns, and act as a barrier to pollinators finding blooms.

October, 2022

Researchers have shown that different plant communities in the tundra play a key role in energy exchange but are not taken into account in climate models. According to this study, the Arctic's diverse vegetation, which is disregarded in climate models, is one of the key factors in the energy exchange between the Earth's land surface and the atmosphere.

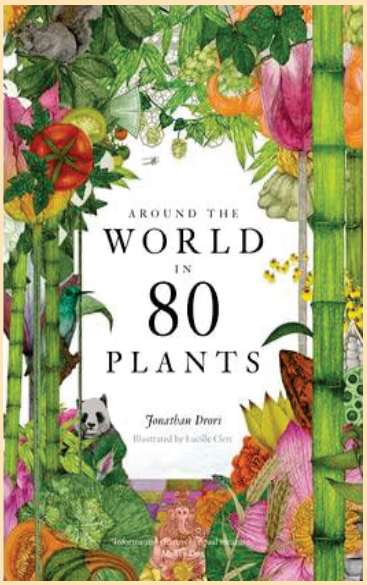
November, 2022

Recent research revealed that the main driver behind blooms is phosphorus, an element used widely in agriculture to fertilize crops that can run from the land into lakes -- especially during heavy rains. Along with phosphorous three other factors were also found responsible for these blooms *i.e.* calm winds, warm surface waters, and a low abundance of tiny crustaceans called zooplankton

December, 2022

The scientists revealed a new mechanism known as nutrient uptake plasticity, which allows marine algae to adapt and cope with nutrient-poor ocean conditions expected to occur over the next decades in response to global warming of the upper ocean. This provides clear evidence that marine phytoplankton is much more resilient to future climate change than previously thought.

Around the World in 80 Plants

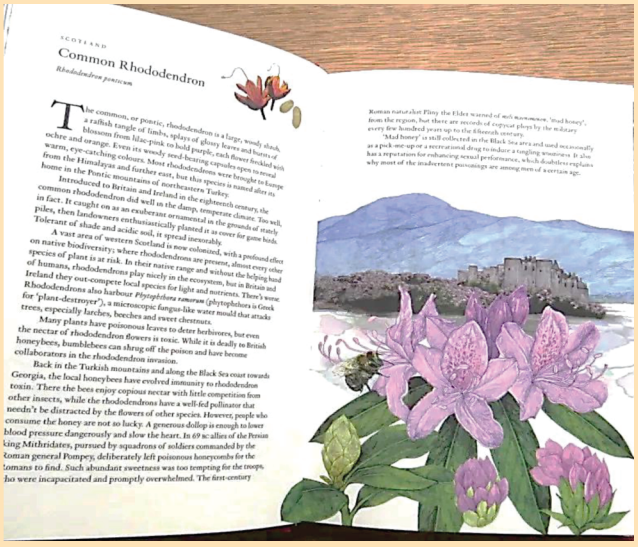


Jonathan Drori's book, written in 2021, is a captivating reading for anyone with an interest in science and plants. The book is a best seller and is considered a delight for the eyes and brain. In this work, Drori travels the world to uncover the science of plants and how they are connected to our history, culture, and folklore. The stories about plants in the book are filled with surprises and offer new perspectives on familiar subjects. The book is divided into short chapters, making it easy to read at one's convenience. Each chapter represents a unique story about a different plant, and the book does not have to be read in a specific order.

Drori was a trustee of the Royal Botanic Gardens, Kew, and has produced over fifty scientific documentaries. He is an accomplished writer who knows how to engage and entertain his readers. The book provides scientific information but is written in a way that even someone with no science background would find accessible. The eye-catching illustrations by Lucille Clerc add to the appeal of the book. Clerc has worked with fashion houses, museums, and royal places, and her illustrations are a contextual representation of how plants are used by humans and animals.

For example, the illustration of the indigo plant native to Bangladesh is particularly fascinating. Before reading the book, the reader may not have known that the plant belongs to the pea family, which is evident from the color of its flowers. Drori explains the process of turning pea plant leaves into the indigo dye and how the stunning, intense color reappears once the cloth is withdrawn from the dye bath and exposed to air.

Another fascinating plant described in the book is the *Rhododendron,* which Drori explains is native to Scotland and was planted in estates for decoration and as a cover for game birds. However, the plant's aggressive spread has had a profound effect on the local biodiversity, and it harbors a microscopic fungus that attacks trees. Additionally, the honey produced by bees feeding on *Rhododendron* nectar is toxic and known as "mad honey." It has been used as a recreational drug to induce tingling wooziness and has a reputation for enhancing sexual performance.



Rhododendron Illustration

The descriptions in the book are lush, complete with Latin names and detailed inflorescence descriptions. The book focuses on the impact of plants on humans and animals, and the reader will learn many little-known facts, such as the death penalty for illegally growing and selling nutmeg and the simultaneous flowering of all bamboo species worldwide. One surprising piece of information is about the Cook Pine, which tilts toward the equator wherever it is grown. The illustrations in the book are beautiful and provide a vivid imagination of the plants described. This book is a perfect combination of description and illustration and is a must-read for anyone interested in science, plants, and their impact on our world

Syeda Shehwar Zahra

Can Vertical Farming reduce the imminent danger of Global Food Insecurity?

Masooma Naqvi
1935- MSc-BOT-18

The global population is mushrooming at a rapid pace. Recently on 15th November, the world's population hit 8 billion. In the next 30 years, amid changing climate and rising food insecurity, we will need to feed 10 billion people with less water and arable land. To feed the rapidly mushrooming population, innovative and reliable ways are needed to save food. Agriculture is one of the world's oldest and most adaptable industry. Looking back at mankind's earliest cultivation practices, we can get ideas to reshape our food system for the future.

Concept of Vertical Farming

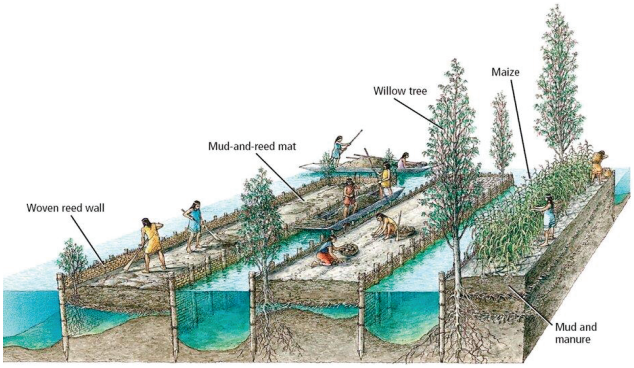
Vertical Farming is an old practice of growing crops over one another in horizontal rows. Vertical Farming allows the conservation of space resulting in higher crop yield per square foot of land used. These farms are mainly maintained indoors, such as in warehouses. Herein environmental conditions could be controlled for the successful growth of plants.



Bowery Vertical Farms

Historical Precursors to the Modern Indoor Vertical Farm

Babylonians are the innovators of advanced agriculture systems. Their hanging gardens, built 2500 years ago, are the earliest prototype of vertical farms. History is full of a myriad of examples of how civilizations have adopted innovative means to manipulate the environment to make farming easier and more productive. Like thousands of years ago, the MesoAmerican Aztec Society pioneered a form of hydroponics. Aztecs grew plants in marshy rafts suspended in rivers and shallow lake beds. Even today the remnants of the arable land of Aztecs known as 'Chinampas' could be seen in Mexico City. In the 1600s, the French and Dutch used "fruit walls" to grow Mediterranean fruits in the extreme cold climate of Northern Europe. These fruit walls protected fruits by capturing heat during the day and releasing it during the night.



Chinampas by Aztecs

Controlled Environment Agriculture (CEA)

All these farming methods are a variation of a practice known today as Controlled Environment Agriculture or CEA. CEA is a type of farming in which plants are grown in spaces in which conditions could be regulated and manipulated according to the plant requirements. Like smart rooms in homes wherein the desired temperature could be set. Smart farms allow variation of light, humidity, temperature, and nutrients in different areas within the same farm. It means now a variety of plants can be grown indoors by customizing their environment.

Modern Day Vertical Farming

Vertical farming is the latest innovation of CEA. Unlike horizontal farming in which plants are grown in horizontal rows over vast areas of land in vertical farming plants are grown in rows of pots placed on top of one another, known as stacks.

These stacks are kept in indoor warehouses, the temperature of which can be maintained. Vertical farms can increase productivity by farming at limited area of land. Farms at Bowery New York is an example of vertical farms.

The infrastructure of modern vertical farms at Bowery New York

Traditional farming relies on the soil as a growing

medium and the soil is fortified with fertilizers to ensure plant growth. However, not all areas have the necessary nutrients in the soil to support farming. Vertical farms, on the other hand, are not limited by soil and instead use hydroponic, aeroponic, or aquaponic methods for growing. The Bowery Company uses hydroponic methods, where the roots of the plants are suspended in nutrient-rich water. Vertical farms also use LED lights for year-round photosynthesis and the cost of LED lights has decreased, leading to an increase in the popularity of vertical farming. The LED lights at Bowery are connected to a central operating system that tracks and controls the growth of plants from seed sowing to harvesting.

Importance of Vertical Farming for our future Food System

To summarize, vertical farming allows a farmer to produce more output by using fewer resources. Moreover, it also reduces transportation cost by locating operations closer to the point of consumption. Some other benefits of vertical farming are explained in detail below.

Water Saving: Around 70% of our planet's surface is covered with water but only 2.5% is fresh. Out of this 2.5%, only 1% of water is easily accessible. Agriculture consumes 70% of the water from this 1% readily available water and that is too much. So vertical farming provides the opportunity to grow high-quality, nutrient-rich crops by using precise amounts of water through hydroponics technique and this water is continuously recirculated. Thus it saves a significant amount of water.

Loss of Arable land: In the last 40 years around 30% of Earth's arable land has been lost to industrialization and rapid urbanization. Along with it, factors like pollution have eroded the nutrient-rich topsoil layer. Vertical farming is an opportunity to turn industrial spaces into smart indoor farms where every square foot of land is used for irrigation purposes.

Pesticides Usage and Food Safety: Globally billions of dollars are invested in pesticides purchased annually. These can severely damage ecosystems. Vertical Farming enables people to produce pest-free plants thus minimizing the use of harmful pesticides. Because vertical farming is carried out indoors, it enables us to control the entire journey of every crop without involving any third party. So vertical farming is also a source of safe food.

Can these Indoor Vertical Farms Feed the World?

While these indoor vertical farms provide unique advantages to the problems we are going to face in feeding a growing planet, the output of these farms wouldn't be enough to feed the entire population. Traditional farmers and vertical farmers need to work in liaison to eliminate future food insecurity.

Apollo's Lunar Regolith and Terrestrial Plant Communication

Bushra Bilal
82-PhD-21



***NASA's Matt Romeyn* works in the Crop Food Production Research Area of the Space Station**

What's for dinner on the moon? Let's suppose you're "stuck" on the moon or relocated to Mars. How will you survive for months and possibly years without resupply? No doubt it's a fearful thought. But recently amazing work has been done by NASA scientists through which an astronaut may be able to grow plants on the moon, and these plants could be used to supplement meals. The growth of plants on celestial bodies will be an important part of space exploration in the future as NASA plans for long-duration missions to the moon.



Zinnia plants from the Veggie ground control system are being harvested in the Flight Equipment Development Laboratory in the Space Station Processing Facility at Kennedy.

Several efforts have been made by scientists for the formation of lunar plant growth chambers and the application of different techniques for plant growth in lunar soil. A space garden that is The Vegetable Production System, named **Veggie**, has been established on a space station.

Veggie's purpose is to help NASA study plant growth in microgravity while adding fresh food to the astronauts' diet and enhancing happiness and well-being in the orbiting laboratory. To date, Veggie has successfully grown a variety of plants, including three types of lettuce, Chinese cabbage, mizuna mustard, red Russian kale, and zinnia flowers.

A question arises here how do vegetables grow in Space Station? And the answer takes us to the formation of a special growth chamber for space plant growth called **Advanced Plant Habitat (APH)**. The Advanced Plant Habitat (APH), like Veggie, is a growth chamber on a research station for growth of plants. LED lights and a porous clay substrate is used in this Advanced Plant Habitat. Along with it, controlled-release fertilizer is also incorporated to deliver water, nutrients, and oxygen to the plant roots. APH had its first test run on the space station in the spring of 2018 using Arabidopsis thaliana (the "white mouse of the plant research world") and dwarf wheat.

Dr. Norman Lewis is the principal investigator for the Arabidopsis Gravitational Response Omics (Arabidopsis-GRO) consortium study, which will be the first study using APH. He and his collaborators are especially interested in what happens to plants in space at the gene, protein, and metabolite levels, what changes occur, and why. A key objective of this research conducted by Dr. Norman and colleagues is to explain the relationship between microgravity and plant lignin content. Lignin in plants has functions quite similar to that of bones in humans. They give structure and rigidity to plants and the support to stand upright against gravity.



Arabidopsis seeds - small flowering plants grew for about six weeks, and dwarf wheat for five weeks in APH

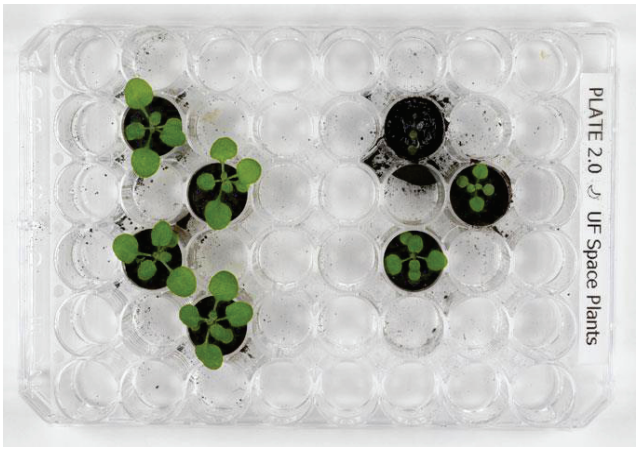
One of the worst nightmares for gardeners is the presence of dirt or regolith that covers the moon. This fine powder of razor-sharp bits is rich in metallic iron, rather than the oxidized kind that is palatable to plants. It's also full of tiny glass shards forged by space rocks pelting the moon. However, it lacks nitrogen, phosphorus, or much else the plants need to grow. So, even though scientists have gotten pretty good at coaxing plants to grow in fake moon dust made of earthly materials, no one knew whether newborn plants could put down their delicate roots in the real stuff.



Opened door of the growth chamber of the Advanced Plant Habitat (APH)

Now let's take a glance at how these plants are being grown from the very beginning. Initially, research was conducted at the University of Florida in Gainesville in which experiments were carried out on *Arabidopsis thaliana*. For this study, the researchers planted *Arabidopsis* in tiny pots each of which contained about a gram of dirt. Four pots were filled with samples returned by Apollo 11, another four with Apollo 12 samples, and a final four with dirt from Apollo 17. Another 16 pots were filled with earthly volcanic material used in past experiments to mimic moon dirt. All were grown under LED lights in the lab and watered with a broth of nutrients.

Plants grew in all the pots of lunar dirt, but none of them grew well enough like those cultivated in earthly material. "The healthiest ones were just smaller," Paul says. The sickliest moon-grown plants were tiny and had purplish pigmentation — an indicator of plant stress. Stunted growth of plants grown in Apollo 11 samples had been observed. This sample had been exposed to the many conclusions



Thale cress plants grown for 16 days in volcanic material from Earth (left) nourished in moon dirt (right). Apollo 11 mission (right, top), in Apollo 12 samples (right, middle) or Apollo 17 samples (right, bottom).

that can be made as lunar soil is highly variable at different sites like earth soil; stress-tolerant plants like spinach can be easily grown in lunar soil. All this required more and more experimental work before creating a lunar garden. On 16 December 2020, China's Chang'e 5 mission returned to Earth with a cargo of about 2 kilograms of rock and dirt it picked up from the Moon. It was the first sample of lunar regolith brought to Earth since 1976. China is the third country in the world that has brought such



This thale cress seedling sprouted from a seed potted in lunar dirt collected during some of the Apollo missions.

material back to Earth after the United States and the Soviet Union.

Chang'e-5 is part of the first phase of the Chinese Lunar Exploration Program. There are still 3 projects left in this phase of the program (Chang'e-6 in 2024,

Chang'e-7 in 2026, and Chang'e-8 in 2027). The second phase of the program is to land Chinese astronauts on the Moon between 2030 and 2039. The objective of this research is to study the moon's history.

Horticulture Therapy – an effective tool to heal people

Shariq Khawaja
83-PhD-22

Horticulture therapy a time-proven practice having therapeutic benefits for garden environments has been documented since ancient times. The first person to document the positive effects of working in a garden on an individual suffering from mental illness was **Benjamin Rush**. Horticulture therapy, vocational therapy, therapeutic horticulture, and social horticulture are the four programs that exist today. In this piece of writing, the main focus is horticulture therapy. Horticultural therapy "is one of the most effective treatments for people of all ages, backgrounds, and abilities" With time the definition of horticulture therapy has evolved and many different definitions are now used, a few of them are "Horticulture therapy is been used for mental and physical health and also to recover from illnesses and help in vocalization rehabilitation. Scott a therapist refers horticultural therapy as a "process that encompasses using gardens and plants, rehabilitative as well as other therapeutic activities to impact people's health and outcomes positively."



According to Relf, a Member of the Horticulture Society, the arts and the science of plant growth, including flowers, fruits, vegetables, trees, and shrubs lead to the development of people's mind and feelings together with the enrichment and health of civilization is called Horticulture therapy. Horticultural treatment (HT) is a recovery process in which plants and horticulture activities are utilized to improve the body, mind, and morale of the people. The term horticulture is derived from the Hortus, meaning a garden and culture is a culture in the dictionary as soil cultivation; the development, improvement, or modification of the mind, feelings, interests, behaviors, tastes, ideas, customs, skills, art, etc.

Horticultural therapy consists of interventions that involve nature-oriented views, gardens, spaces, garden tools, healing plants, and rehabilitation used to improve and restore the well-being of people accompanied with garden occupations that can be carried out with people that are disabled and offer other general benefits. "The professionals having specific education, training, and credentials in the use of horticulture for therapy and rehabilitation are known as Horticulture Therapists.

Horticulture therapy is utilized as a strategy for treatment for various age gatherings in multiple conditions to advance well-being, prosperity, and social union. In recent years, cultivation has been utilized as a reasonable treatment for individuals with handicaps and different requirements, incorporating grown-ups with physical and mental inabilities, handicapped kids, needy individuals, and detainees. Therapeutic gardens are gardens that are specifically designed for applications within healthcare, rehabilitative, and other therapeutic settings. It is a plant-dominated environment having healing elements

of nature. Therapeutic gardens are of different types like healing gardens, enabling gardens, rehabilitation gardens, and restorative gardens. The patients are treated by different methods depending upon the illness they are suffering from. Söderback *et al*. (2004) found that "horticulture therapy mediates emotional, cognitive or sensory-motor functional improvement, increased social participation, health, well-being, and life satisfaction."

One of the constructive outcomes of plants on the useful mental capacities of older individuals is that it significantly affects their minds through the perception of gardens and cultivation. Studies have demonstrated the way that openness to plants can make positive feelings and lessen mental pressure as well as increment the close to home and mental soundness of the older. Horticulture therapeutic gardens are gardens that are designed especially for the elderly or people seeking horticulture therapy. These gardens are designed with special care with the aid of professional designers. Nowadays it is a widely accepted truth that horticulture therapy is an effective beneficial modality, having been used in rehabilitative, vocational, and community settings widely.

Emerging trends of mushrooms; usage in cosmetics industry

Usman Mustafa Rajput
81-PhD-22

In past, cosmetics items were used only to alter a person's look; however, these products were never utilized to treat, cure, or mitigate skin conditions. But now the trend has changed. In contemporary world, cosmetics are now utilized to treat various skin disorders such as acne, wrinkles, dark spots, blemishes, and freckles by combining them with nutritional ingredients that exhibit medical drug-like benefits and adding them to serums creams, lotions, and ointments. This is done for skincare at cellular level. Mushrooms have been used as a source of food and medicine for a long time, but in recent times, researchers have identified various novel compounds potential enough to be used in cosmetics. The future of mushrooms in the cosmetic industry is bright because of the demand for natural ingredients compared to synthetic ones.

How mushrooms can act as the potential booster for the cosmetic industry

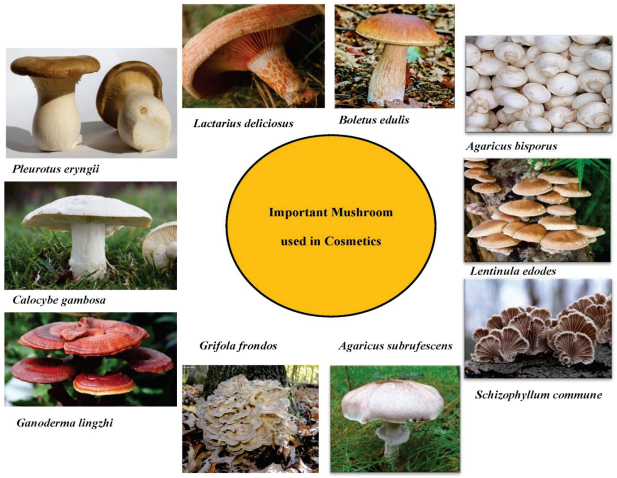
Mushrooms are rich in naturally occurring bioactive chemicals that have much potential to be employed as cosmetic components to treat a variety of skin conditions. It is known that tyrosinase inhibitors in mushrooms lower melanin concentration and limit tyrosinase activity which results in hyperpigmentation. Even though the bioactive chemicals responsible for this action have not been understood yet, *Pleurotus* species seem to be the most effective among mushroom species. Additionally, species of various genera, including *Agaricus*, *Inonotus*, *Lentinula*, and *Ganoderma*, possess anti- tyrosinase action. Various other genera are also in the process of analysis for their potential usage in curing issues related to hyperpigmentation such as melasma and age spots.

Bioactive compounds found in mushrooms

Polysaccharides:

Many different polysaccharides have been extracted from mushroom fruiting bodies and mycelia cultures. Some of these polysaccharides include schizophyllan from *Schizophyllum commune*, lentinan from *Lentinula edodes,* α- and β-glucans from *Agaricus subrufescens*, *Agaricus bisporus*, *Ganoderma lingzhi*,

and *Grifola frondos*. The high concentration of mushroom polysaccharides has sparked an increased interest in their potential benefits to the skin. These benefits include an increase in the moisture content of the epidermis and stratum corneum. These polysaccharides also lead to an increased skin's capacity to retain moisture and a reduction in the skin's ability to lose moisture. When included in topical cosmetic products, mushroom polysaccharides function like that of the potent moisturizer hyaluronic acid.



Phenolic compounds: Phenolic compounds may be found in a natural state in foods such as fruits, vegetables, herbs, spices, cereals, and nuts. They protect against ultraviolet radiation, insects, and bacteria and are often found in mushrooms too. Their molecular structure is characterized by the presence of one or more benzene rings attached to one or more hydroxyl groups. Caffeic acid is the most common phenolic compound which is responsible for cosmetic properties. These chemical compounds are found in various mushroom species, including *Agaricus bisporus, Calocybe gambosa, Pleurotus eryngii, Cantharellus cibarius, Boletus edulis, Lentinula edodes, Craterellus cornucopioides, Lactarius deliciosus, Tropicoporus linteus, Hygrophorus marzuolus, and Pleurotus ostreatus.*

Terpenoids: Mushrooms are a significant source of terpenoids that have several cosmetic applications. There have been reports of triterpenes presence in several mushrooms, including *Ganoderma spp.* Canthaxanthin is a reddish-orange keto-carotenoid pigment found in the edible fungus *Cantharellus cinnabarinus,* an effective anti-aging agent that rejuvenates and fortifies the skin. Carotenoids are the most prevalent tetraterpenoids, having antioxidant and UV protective properties. Carotenoids are historically utilized as natural cosmetic components, food colorants, nutraceuticals, and animal feed additives due to their health and color-related qualities.

Vitamins: Mushrooms have the ability to produce a wide variety of vitamins, including thiamine (VIT B1), riboflavin (VIT B2), niacin (VIT B3), biotin (VIT B7), folate (VIT B9), cobalamins (VIT B12), vitamin C (ascorbic acid), and vitamin D (calciferols). Vitamin D2 (ergocalciferol), found in abundance in *L. edodes, A. bisporus*, *P. ostreatus,* and *P. ferulae*, is one of the most important factors in maintaining the health of the immune system of the skin. In sunlight, the ergosterol that naturally occurs on the surface of mushrooms is converted into vitamin D2. Vitamin D is known to make teeth and bones strong, and it also efficiently boosts moisture content and hydrates the skin. The fruiting bodies of *Craterellus cornucopioides, Cantharellus cibarius, Hericium erinaceus*, and *L. edodes* were shown to have high quantities of vitamin B12. Due to the ability to hydrate the hair, skin, and nails and slow the signs of aging, vitamin B is the best source of potential cosmetic products found in various types of mushrooms.

Brands using mushrooms in cosmetics:

Menard is a brand of cosmetics using mushroom

extracts. It uses *Ganoderma lucidum* extract to improve the skin's look, remove toxins, and heal skin damage caused by free radicals and excessive exposure to UV rays. The Aveeno Positively Ageless Eye Cream is a hydrating product with a natural Shiitake (a mushroom) Complex. Clinical tests have shown this antioxidant to function synergistically with the skin's natural regeneration process.

Future directions: There is a great deal of interest in forming new products based on mushrooms in the cosmetic sector. Most researches focused on creating natural cosmetics has centered on plant species during the last two decades. The mushrooms are less explored as far as cosmetic applications are concerned. These findings provide a clear direction for younger researchers to analyze various other mushroom species to produce novel cosmetic products. Discoveries of compounds and related mechanisms will boost the cosmetic industry in the future.

Promoting Kitchen Gardening;
a need of an hour
Aleen Fatima
0372-MPHIL-BOT-21



In this modern era of fast-paced urban life and rapid industrialization, the land for cultivation purposes is continuously decreasing thus more problems for getting fresh vegetables, grains and other edible commodities are arising. To cope with this situation, the concept of kitchen gardening should be introduced formally in cities. In kitchen gardening, vegetables for domestic use are grown at the home, lawn, or in other spaces available.

Due to the rapidly increasing population and the resultant increase in demand for vegetables, farmers have adapted new techniques to increase per unit of vegetable production. This involves the use of chemical fertilizers and pesticides. Although, production at the farm level increases however, the quality of vegetables is seriously affected due to the extensive use of fertilizers, poor drainage system, outdated cultivation practices, etc. Irrigation of vegetables with sewage water in urban areas has arisen serious health concerns for consumers. Hence, the purpose of kitchen gardening is to produce vegetables that are free of any pesticides and chemicals and have high nutritive value from domestic use Pakistan is blessed with unique climatic and topographic conditions, which create diverse agro-ecological conditions suitable for growing almost all kinds of vegetables.

Pakistan has the world's sixth largest population; in 2007 the population was over 169 million which now has exceeded 200 million and has a total crop area of about 22.94 million hectares. Eventually, this will lead to higher demand for food and agricultural products. Kitchen gardening has a vast potential for addressing the food and health-related issues of the urban population. The obvious advantages associated with household gardening are pesticide-free production and the availability of nutritive vegetables at the doorstep. If kitchen gardening is made common then everyone would be able to get a balanced diet recommended for a healthy life.

In kitchen gardening, raw materials involving plastic pipes, water cans, tires, and glass bottles are utilized. There is no need for artificial fertilizers. The kitchen

waste including peels of fruits and vegetables is used as compost. It possesses excellent nutritive value to meet the need. Along that egg shells are also used as organic fertilizer. All these things are harmless as they do not contain any hazardous chemicals.

Gradually this activity is becoming popular among the young generation, especially females. To summarize the objectives of kitchen gardening are:

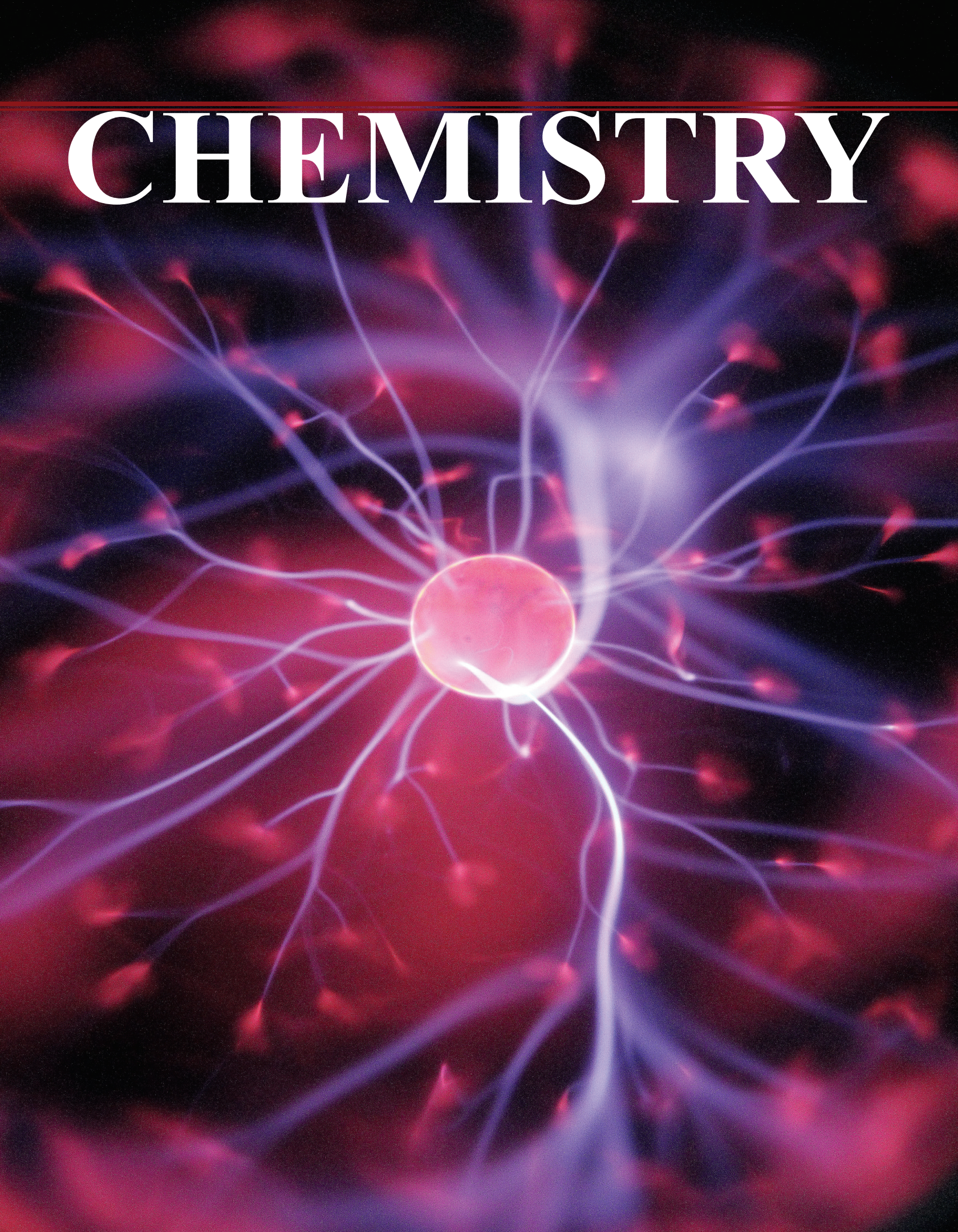
- To provide fresh vegetables with high nutritive value.
- To help people reduce their financial burden.
- To improve the air quality of cities.
- To get more yield by utilizing minimum space.
- To help the poor meet their food requirements.

How high yield could be attained by kitchen gardening?

Along with vegetables, one can plant different varieties of seasonal fruits and flowers. Also, medicinal herbs could be planted. The initial planning involved in gardening is very important. Different types of vegetables should not be mixed. This helps prepare the land each time for sowing new seeds. Availability of light is critical for vegetables. So choose a place to sow seeds that receive at least 7-8 hours of direct sunlight. The vegetables like cucurbits, bitter gourd, bottle gourd, etc. which have the growing habit of vines should be kept separate from vegetables that are not a vine. These vines are grown separately and provided support with sticks. Land preparation is the key to successful crop yield. The land selected for kitchen gardening should have good drainage and aeration properties. The Organic matter should be mixed before seed sowing. Leaf litter, vegetable waste, ash, and egg covers are good natural sources of organic matter. For the control of pests, chili spray could be sprayed.

Kitchen gardening is a very productive activity. It should be promoted by educational institutions at the community level. Moreover, free workshops should be conducted so that people can easily learn the art of kitchen gardening. If opted this activity will have far-reaching impacts beneficial for mankind.

CHEMISTRY



TIMELINE

January , 2022

A team of researchers at the University of Pakistan develops a new method for synthesizing graphene, a material with a wide range of potential applications, including electronics, energy storage, and biomedical devices.

February , 2022

Scientists at the National Center for Chemical Sciences in Lahore discover a new class of catalysts that can be used to speed up chemical reactions, making it possible to produce chemicals more efficiently and sustainably.

March , 2022

Researchers at the Quaid-i-Azam University in Islamabad develop a new method for producing biofuels from algae, a promising alternative to traditional fossil fuels.

April, 2022

A team of chemists at the Pakistan Institute of Engineering and Applied Sciences discover a new method for producing hydrogen fuel, a clean and renewable source of energy.

May, 2022

Scientists at the Lahore University of Management Sciences develop a new method for producing low-cost solar cells, making it possible to produce solar energy more affordably and scale up its use in Pakistan.

June, 2022

A team of researchers at the University of Agriculture in Faisalabad discovers a new way to produce biofertilizers, which can be used to improve crop yields and reduce the need for chemical fertilizers

July, 2022

Scientists at the National Institute of Chemical Technology in Karachi develop a new method for synthesizing nanomaterials, which have a wide range of potential applications in electronics, energy storage, and biomedical devices.

August, 2022

Researchers at the Institute of Chemical Sciences in Quetta discover a new way to produce organic chemicals using bacteria, making it possible to produce chemicals more sustainably and reduce dependence on fossil fuels.

September, 2022

A team of chemists at the Lahore Institute of Chemical Engineering develops a new process for producing carbon nanotubes, which have potential applications in electronics, energy storage, and biomedical devices.

October, 2022

Scientists at the University of Sindh in Hyderabad develop a new method for synthesizing superconducting materials, which have potential applications in electronics, energy storage, and transportation.

November, 2022

Researchers at the Balochistan Institute of Chemical Sciences discover a new way to produce biofuels from waste materials, reducing the amount of waste sent to landfills and producing a clean source of energy.

December, 2022

A team of chemists at the University of Punjab in Lahore develops a new method for producing bio-based plastics, which can be used to reduce dependence on petroleum-based plastics and improve sustainability.

Bypass Animal-based diet: Plant-based diets can Avoid Pandemics

Amber Shaheen Abbasi
0848-MPHIL-CHEM-21

Highlights

- The plant-based diet includes grains, vegetables, fruits, and legumes which contain a sufficient amount of lipids, proteins, minerals, vitamins, carotenoids, and polyphenols.
- Researchers discourage the extensive use of meat products which can lead to the risk of cardiovascular disease, strokes, type II diabetes, obesity, and colorectal cancer.
- The intake of more vegetables and fruits reduces the risk of cardiovascular disease.
- Polyphenols have an anti-oxidative effect which prevents the oxidation of LDL (low-density lipoprotein).
- A vegan diet contains non-inflammatory agent and alkaline proteins which helps in protecting renal cells.
- Plant-based food is responsible for the lengthening of telomeres which in turn helps in protecting the cellular damage.

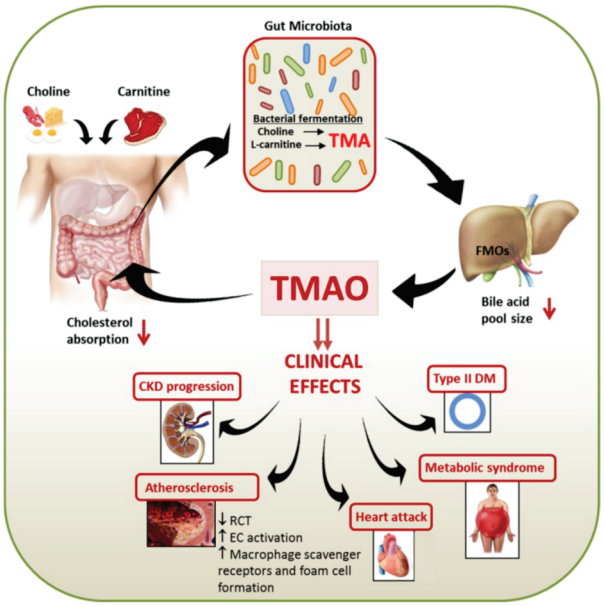
The plant-based diet is a panacea for human health as well as for dramatic climate change. A diet largely based on grains, vegetables, fruits, and legumes is of plant origin and contains a sufficient amount of lipids, proteins, minerals, vitamins, carotenoids, polyphenols, etc. Plant food sources not only reduce the use of medications but are also responsible for a healthier lifestyle. This does not contain saturated fats or Trans fats. Recent studies show that moving towards a plant-based diet can mitigate climate change by eliminating greenhouse gases. On the other hand, meat and dairy products are rich in cholesterol and saturated fats. Therefore, researchers discourage the extensive use of meat products in refined along with processed forms. The ultra-processed food further declines its quality. It can lead to the risk of cardiovascular disease, strokes, type II diabetes, obesity, and colorectal cancer.

By accentuating the fact, globally one out of five young people dies because of an unhealthy diet. According to the WHO, no communicable diseases report, and 80 % of diseases are more common but unnoticeable. This includes cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes mellitus and their death rates are 17.9, 9, 3.9, and 1.9 million respectively. 59 % of adults and 29 % of children die due to being overweight in the European region. Recently reported research proves that the intake of more vegetables and fruits reduces the risk of cardiovascular disease. WHO recommends 400 g of fruits per day excluding starchy tubers.

The recurrent use of meat in processed and unrefined forms can surge the risk of bowel cancer. The report of the cancer research fund found that cancer risk can shrink by adopting moderate use of red meat and processed meat. Research conducted on non-meat eaters, a person who is dependent on a vegetarian diet is healthier than those of the meat-eaters. Therefore, a vegan has a low body mass index which brings down the probability of diabetes. The world is shifting toward a plant-based diet that cuts down greenhouse gas emissions and protects the biodiversity of plants. The planetary health is also preserved by planting fewer grazing plots and gradually expanding the agricultural land for growing more crops. In 2020, the burden on the healthcare system exhibits 2.4 million deaths worldwide due to meat consumption.

The implication of intake of meat, fats, and carbohydrates can cause atherosclerosis. This weakens the endothelial cells of cardiac muscles. The antidote for atherosclerosis is polyphenols from a plant-based diet. The polyphenols have an anti-oxidative effect which prevents the oxidation of (LDL) low-density lipoprotein. The trimethylamine-N-oxide is a

metabolite of L-carnitine which results due to intake of red meat. This metabolite is an active marker for atherosclerosis of coronary artery disease. The omnivores have a microbiome for the metabolism of L-carnitine which is absent in a vegan.



In another research, there is an ecosystem of bacteria that are affected by taking the plant-based diet. This microbiota affects the metabolism pathways of the gut. The prospect of pre-pregnancy gestational diabetes is significantly low in vegetarian mothers. A substantial intake of a non-vegetarian diet before pregnancy possesses a higher risk of gestational diabetes. Therefore, an individual the insulin sensitivity is more in a vegan as compared to a non-vegan. The frequent consumption of 100 g of red meat and 40 g of processed meat per day can elevate the risk of various types of cancers like non-Hodgkin lymphoma, colorectal, gastric, oral cavity, and breast cancer. The aftermath percentage risk associated with this intake quantity of meat is 11 to 51 % and 8 to 72 %. On the other hand, a plant-based diet can ameliorate kidney disorders and delay their failure. A vegan diet contains non-inflammatory agent and alkaline proteins which helps in protecting renal cells. It can initiate dialysis.

Notwithstanding a beneficial plant-based diet that lessened the risk of various lethal disorders, the low plant-based diet is the mainspring of elevated risk of cardiovascular deterioration. The healthful plant formed includes nuts, legumes, grains, fruits, vegetables, tea, and coffee while the low plant food comprises beverages, sweets, sweetened juices, refined grains, potatoes, and fries. The plant-based diet provides essential vitamins for the human body i.e., vitamins A, C, and E. This is responsible for the lengthening of telomeres which in turn helps in protecting the cellular damage. It directs the slowing down of the process of aging. Another research proves that the main hurdle faced due adoption of the plant-based diet is non-educated people along with older people. Among them, 79 % agreed to the health benefits associated with a decreased level of saturated fat intake. There are 76 % of individuals believe that a plant-based diet would help increase their fiber intake and 70 % belief that it prevents diseases. However, over time the consumption of a plant-based diet still becomes a challenge to intake instead of an animal-based diet. It will take a long to become a complete substitute for animal food sources because the food industry for processed plant-based food does not meet the consumer demand and quality. It is the need of the hour to disseminate people to move toward plant food sources for the well-being of their future generations.

3-D Printing
M Naimtullah
0703-BH(E)-CHEM-20



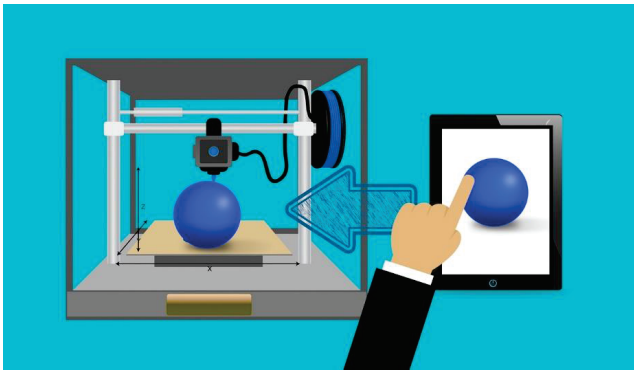
Once fiction is now a reality, 3-D printing technology is no longer new. The general concept used in 3-D printing was first described by **Murray Leistering's** story **things pass by** describing: "But this constructor is both efficient & flexible. I feed magnetic plastics (the stuff they make houses & ships nowadays) into this moving arm. It makes drawings in the air following drawings scans with photocells. But plastics come out of the end of the drawing arm & hardens as it comes…. following drawings only"
3-D printing is no longer new, first invented in 1981 by Hideo Kodama, is the making of a 3-dimensional object from a CAD (computer-aided design) model by prototyping layer by layer. Developments were made & 3-D printers have reached the quality and price that allows most of the world to enter the world of 3-D printing.

Working with 3D Printers

3D Modeling Software
CAD software applications are used for 3D modeling. Because of small details and achieving high precision and accuracy, software modeling is the most important step. As if you want to print teeth alignment, a model is created according to the required details of an individual. The ability of 3D modeling software ability for achieving high accuracy in design makes it a game changer for industries. Astronauts also utilize modeling for creating complex & specific space rocket parts.

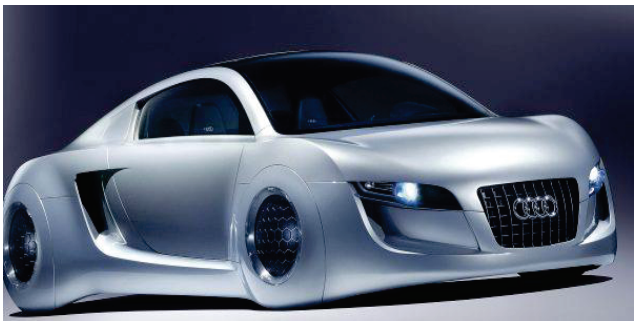
Slicing the Model
Once a model is created, it's sliced. Since machines cannot conceive a concept of 3 dimensions, layers of models are made to make the final 3D product. Slicing software scans the model and instructs the printer how to move for creating layers & filling for strengthening and shaping the product.

3D Printing Process
3D printers are the same as traditional inkjet printers, except they utilize the polymers of plastics for inking/making the product. A nozzle moves back & forth omitting polymers of plastic layer by layer, waiting for drying, and then adding a next-level layer. They add hundreds to thousands of 2D layers to make a final 3D product.



3D printing process: CAD is the model being printed.

3D Printing Material
For achieving both objectives of any entrepreneur, low cost & quality, several materials are used to make a product. Some of them are Acryl nitro Butadiene Styrene, Carbon Fiber Filaments, Conductive Filaments, Flexible filaments, Metal filaments & wood filaments.



Applications

The earliest application was by the die makers for manufacturing spectrum. Rapid prototyping was on the earliest variants to reduce the lead time & cost of new developing prototypes of new parts & devices. The **Audi RQS** was made with rapid prototyping industrial KUKA robots for the **I Robot** movie (picture attached).

Food Industry

Food is squeezed out, layer by layer into 3-dimensional objects. A large variety including chocolate, candy, pasta, and pizza is suitable candidates for food additive manufacturing. **NASA** is also working to develop 3-d printed food to limit food wastage & prepare food according to the dietary plans of astronauts. In 2018, an Italian bioengineer, Gluseppe Scionti developed technology to produce fibrous plant-based-meat-based analogs using a custom 3D bio-printer mimicking meat texture & nutritional values.



Pixel Pasta, made by the 3D printing technology

Fashion Industry

The fashion Industry is also embarked by 3D printing. Fashion designers from worldwide, experimenting & printing clothes, shoes...etc. Commercial production is using 3D printing technology for marketing strategies. Nike manufactured Vapor Laser Talon football shoes using a prototype & New Balance is manufacturing custom-fit shoes for athletes. On-demand customization is also being provided for customers. On-demand customization of glasses is also underway at big firms.



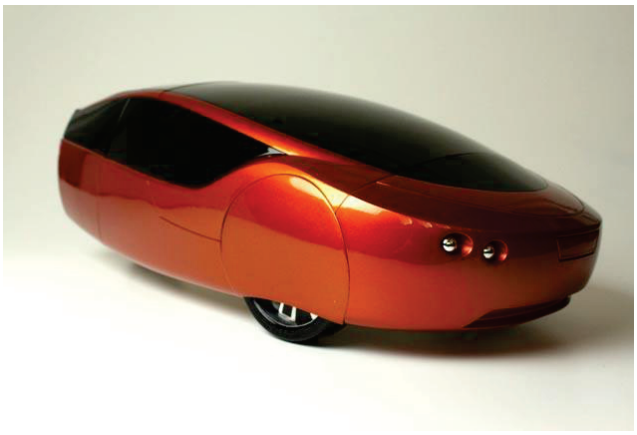
3D Modeling in Fashion Industry



Adidas 3D shoes, available in market

Transportation Industry

To meet the save earth agenda, researchers are working out to reduce the consumption of fuels & power retain technology, 3D printing has been astonishing so far. In 2014, supercar manufacturers printed the full car body using a 3D printer named **Urbee**. Parts of jets & helicopters are also being printed using fewer resources than actual ones.



Urbee, a complete3D-printedcar

Health Sector

3D printing is being used in health depart since the 1990s, working mainly on anatomical modeling of bony reconstructive surgery. From patient-matched implants leading to truly personalized implants that fit one unique individual is the extension of this work. Virtual planning of surgery & guidance using 3D-printed, personalized instruments are being applied while training professionals. 3D printing also finds its applications in the pharmaceutical industry. Human hearing aid & dental industries are expected to be the next big things in development by using 3D printing technology.



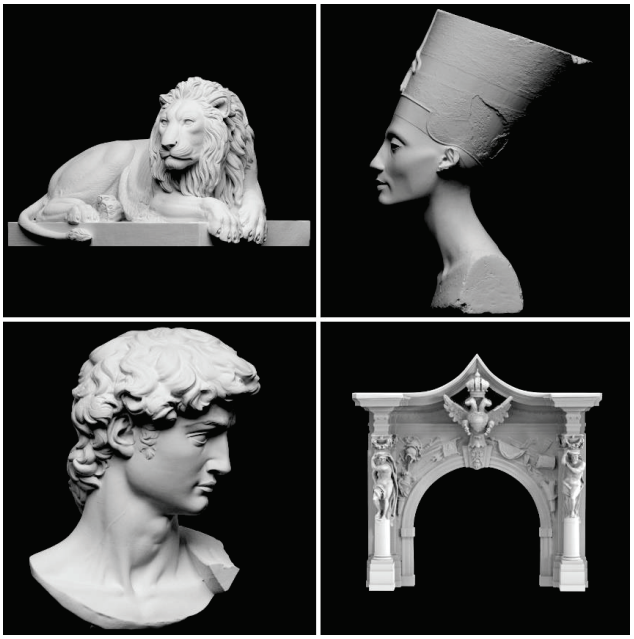
3D printed organ models.

Education Sector

Particularly open-source 3D printers are widely making their way into classrooms. In science & technology, 3D printers offer unprecedented revolution followed by fast prototyping by the students, and fabrication of high-quality instruments from open hardware for researchers, that too even at low cost.

Cultural Heritage

Culture represents the country. 3D printing is being utilized for preservation, and restoration purposes. Missing pieces of sculptures and art are also being developed at history museums worldwide.



3D-printed sculpture models

Recent Developments

In biomedical sectors, technology has been developed for dealing with soft structures & organs. Even during the COVID-19 pandemic, various personal protective equipment was prepared. As of 2022, 3D printing has become an industrial tool as well as a consumer product with low cost.

Future Impact of 3D Printing

Futurologists believed that 3D printing signals the beginning of the 3rd Industrial Revolution. Companies are employing 3D printing technology for making prototype models within hours, instead of wasting both time and dollars in research and development. Both environmental and social changes are going to take place via 3D printing.

AMPHIPATHIC MOLECULES

Mubarra Naqi
0201-BH-e-chem-20

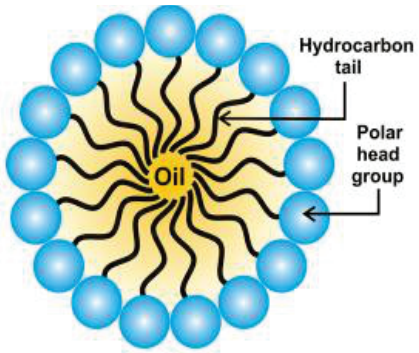
In general, there are two types of molecules one that loves to dissolve in universal solvent water hydrophilic, and the other, hydrophobic which hates water. In between, they are the molecules acquiring properties of both groups. Such molecules are called amphipathic or amphiphilic. This word is derived from the Greek letter "*Amphi*" meaning both and "*philic*" meaning loving. So, these are compounds that have strongly polar and nonpolar regions in a single molecule. The nonpolar region is usually a long hydrocarbon chain and the polar is an ionic part such as the head. A chemical compound that is amphipathic is called amphiphile. Their contrasting polar and non-polar nature determine their behavior in an aqueous medium. The ionic character of the polar head is hydrated readily, on the other hand, hydrophobic tails remain insoluble in water. So, these molecules can dissolve both in organic solvents and water.

When amphipathic molecules are allowed to get themselves dissolved in water, they result in the formation of a variety of peculiar structures. The presence of a small number of molecules causes the formation of **monolayers** on the surface of the water, with their head groups only dissolved. However, stirring the mixture vigorously containing larger quantities of molecules sets up spherical **micelles.** During micelle formation, the polar groups are oriented toward the solvent molecules and are hydrated immediately, while hydrophobic interactions cause aggregation of non-polar groups keeping them out of contact with water. The relative difference in the size of the hydrophobic and hydrophilic portions of amphiphile can cause these molecules to arrange themselves in the form of sheetsrather than micelles. These sheets are called **bilayers** constituting hydrophobic tails sandwiched between hydrated polar surfaces. This conformation allows their parallel arranged hydrophobic tails to

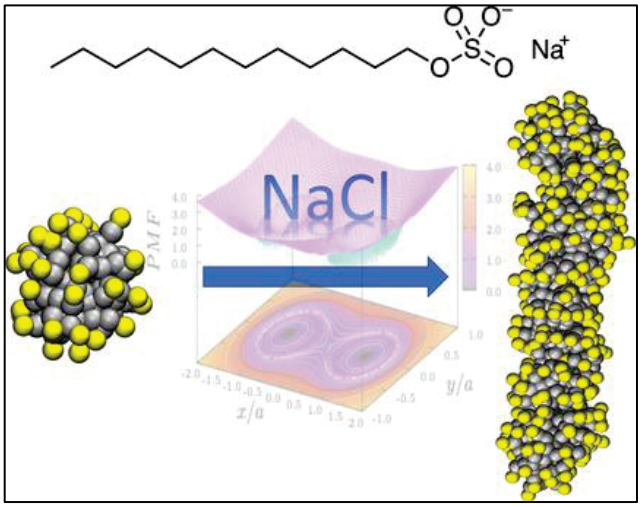
interact via van der Waal forces ionic heads are strongly hydrated by water.

Many biomolecules are amphipathic such as proteins, phospholipids, bile salts, and glycolipids. A phospholipid is one of the most important amphipathic molecules. It consists of 2 fatty acid chains which are bound to a polar phosphate group. The negatively charged phosphate group attaches with many other compounds such as serine and ethanol amine to form phosphatidylserine and phosphatidylethanolamine respectively. The two fatty acid long chains of hydrocarbons are the hydrophobic tail of this amphiphile. Phospholipid due to its amphipathic nature appeared as an essential component of biological membranes. The role of phospholipids in membranes is discussed below. Bile acids belong to a steroid structure made up of 4 rings along with a side chain that ends in carboxylic acid and hydroxyl groups. They form micelles after aggregation around lipids. They act as surfactants (surface active agents) when aggregated. They perform a major role in the emulsification of lipids. So, bile acids prevent fat droplets from aggregating in larger particles.

Functions of amphipathic molecules:



The plasma membrane is one of the most important structures made up of biomolecules whose amphipathic nature made it able to become selectively permeable. **Phospholipids** are key components that occupy a large portion of the membrane in animal cells. The hydrophobic and hydrophilic regions orientate themselves in the form of a lipid bilayer. The arrangement of the lipid bilayer is very pivotal with hydrophobic tails inward and hydrophilic heads outward to the movement of molecules across the plasma membrane. It allows the non polar molecules to navigate the other side readily through hydrophobic region whereas the polar molecules must be modulated. Certain types of proteins, ions, and water need carrier molecules such as carrier protein to pass through the membrane. These carrier proteins provide enter the cell to maintain homeostasis. **Cholesterol** is a mechanism for charged groups so that they can exit or also part of the animal plasma membrane and is an essential amphiphile. Their presence in the plasma membrane regulates the structural integrity and fluidity of animal cells. These amphipathic molecules make the animal membranes able to survive successfully without a cell wall. Moreover, another amphipathic **glycolipid** permits cell-to-cell interactions and enables tissue formation by cell adhesion. Hence amphipathic molecules play a key role in the human body.



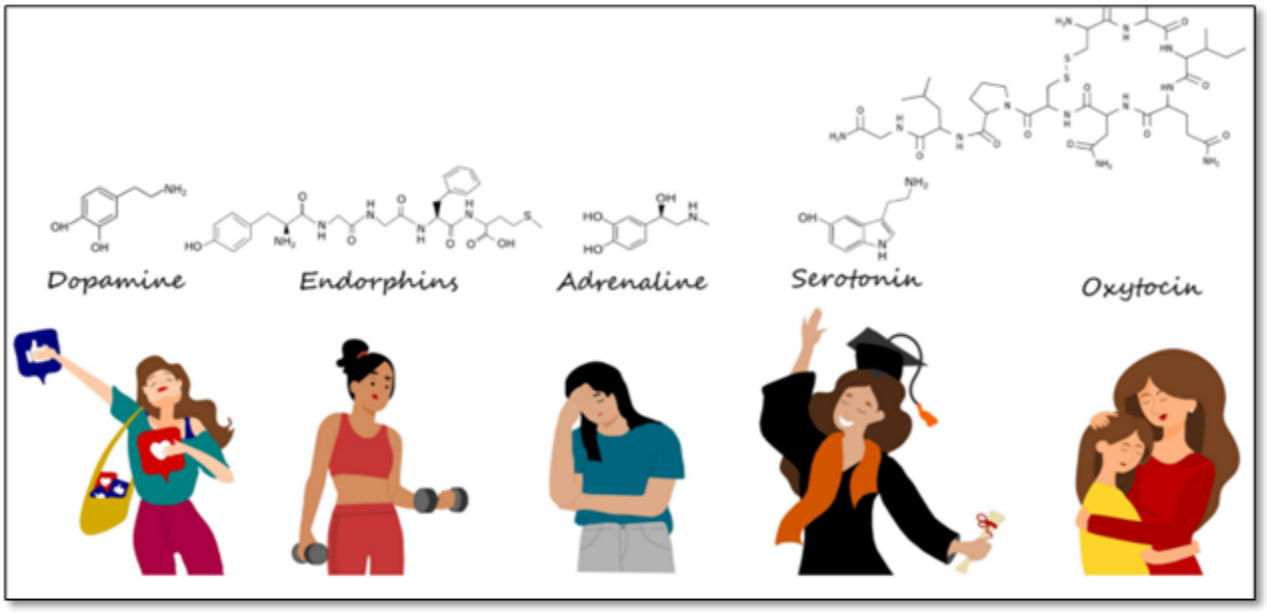
Sodium Salt of Palmitic acid in soaps.

Soap industry:

Besides from a biological point of view, amphipathic molecules provide the chemical basis of the soap and detergent industry. Soap is made up of fatty acid salts especially sodium salts, for example, sodium salt of palmitic acid, which are ionic due to the presence of carboxylate at one end and non polar hydrocarbon chain at another end. This characteristic makes it able to dissolve stains. Stains that are organic such as oils cannot be rinsed off through the water. So, hydrophobic parts of fatty acids dissolve these organic stains. Soap when applied on the skin, clothes, or dishes dissolves the grease by its non-polar part while forming micelles and the polar part of the amphiphile takes that grease away with water. These molecules are also known as **emulsifiers.** These types of molecules are also used in food dressings usually for salads they let non-polar parts such as oils and polar parts such as vinegar be suspended in the same mixture. Hence, amphipathic molecules are very vital in both biological as well as physical fields.

The Chemistry of Emotions
Seerat Fatima
0224-BH-Chem-20

Emotions might have different, discrete, distinctive, and contradicting meanings for mely sacred ambiguities. From those vague everyone.
But no one can deny the fact that the beauty of human life is characterized by the amalgamation of bitter and sweet, mild and wild, deplorable and marvelous emotions. That inexplicable yet incredible possession depicts the splendid individuality and segregation of humans from all the other creatures existing in the vastness of the earth.



From that warmth, you feel after getting a hug, to that strong urge to hold a hand, from that senseless silly grin over a lovely remark from a friend to that ironic obnoxious smirk on encountering a foe, from that cruel, piercing pain for some unpossessed longing, to those hyperactive nerves over a nearly meaningless victory, from experiencing that calm and content of expressing your inner perplexity to bearing that constant burden of undelivered messages and long descriptive passages, passages of valueless words adorned with extra expectations to selfless yet unparalleled sentiments, from undeniable needs to many hidden, concealed vulnerabilities, from needing an escape from that constant bewilderment more like self-imposed imprisonment to wanting to get lost in your mental faculties, from repenting over a long-forgotten sin to surrender in front of your violent intrusive tendencies. From enjoying that graciousness of love to miserably watching this blessing turning into a curse, from being brave enough to let go to fall prey to that noxious ailment of hatred and abhorrence. Too many emotions are serene, soothing, and comforting to one extent and completely weird, disgusting, and troublesome to the other.



Have you ever realized or tried to ponder over the fact that there must be some driving force, some controlling agency, and some dynamic and efficient systematics behind several emotions you encounter daily? And yes, there surely is! The existence of that remarkable control comprises the brain chemicals or neurotransmitters.

One of these chemicals is **Dopamine** having formula **$C_8H_{11}NO_2$,** a brain chemical responsible for instigating the feeling of happiness and joy which vary in intensity from that light amusement you felt on eating your favorite food to those severe butterflies you felt in your stomach on eyeing a beloved all because of dopamine playing intricately with your nerves becoming a source of unexplainable felicity and blissfulness. Low levels of dopamine result in various psychological disorders like continuous sadness, depression, and agony. Psychoactive relaxants; are drugs or substances responsible to cause a rapid surge or a fast shut in the quantities of various brain hormones. Stimulants are types of psychoactive drugs including caffeine, nicotine, and amphetamines which are often used to increase the dopamine level in the brain, however, these are quite addictive, and the users are often unable to cope with or suppress the addiction once it starts. Another interesting neurotransmitter that is responsible to produce wonders in the human body is "adrenalin" **($C_9H_{13}NO_3$)** this is also termed an emergency hormone and is closely associated with sudden reflexes and immediate instincts. That powerful reflex of yours to suddenly push your hand away from touching a hot object to that rapid escape in the middle of the road when a mighty car is about to hit you is all Because of "adrenaline".

Serotonin **($C_{10}H_{12}N_2O$)** is another brain chemical not so different from dopamine, it is responsible for controlling our simple to severe mood swings, and it is also responsible for regulating sexual arousal, low serotonin levels in your body are indicated by a high sexual desire on contrary high serotonin levels will result in low sexual activity. A good serotonin level in your body will play a huge part in keeping you happier, calmer, stable, and well focused, however, the lack of serotonin anxiety is comprised of the consolidated and continuous feeling of excessive fear and nervousness. Minor near neglect able fears to some severe life-threatening phobias walking alone on a jam-packed road, to fail a simple exam it's all because of Serotonin. **Fen-flur-amine and Fluoxetine** are psychoactive drugs having effects on the levels of Serotonin in the brain. Fenfluramine is a Serotonin releasing agent used to control and improve mood swings, appetite, and other body essentials, while Fluoxetine which is commonly sold under the brand names "Prozac" and "Sarafem" is a common antidepressant used to treat severe human emotional stigmas like major depressive disorder and obsessive-compulsive disorder, etc.



Oxytocin **($C_{43}H_{66}N_{12}O_{12}S_2$)** which is fondly referred to as the "Hugging drug" is the brain chemical behind the feelings of affection and love. The hormone is released during physical contact. Increasing comfort leads to great bonds and friendships and is involved in inculcating deep trust and dependence in humans for each other that's why it plays a crucial part in maintaining social relations and is probably the reason humans are known as "Social Animals". This hormone is concerned with causing longterm positive responses opposite to the temporary results of dopamine action. Oxytocin through its nasal administration is responsible to exhibit psychoactive functions in the human body.

Endorphins are hormones released in response to pain. They force us to come out of our comfort zones, doing things we are not willing to do. For example, that glee you experience after taking a cold shower for one or two minutes on a breezy winter morning to that pleasure you experience on deep belly laughs are all induced by endorphins. Opioid medications (e.g., Vicodin, Morphine, and Fentanyl) are commonly prescribed in the postoperative period, these drugs increase the levels of endorphins in the body instigating a feeling of calm, contentment, and peace. Psychoactive drugs or psychoactive relaxants the term mentioned in the above content are the agents responsible for causing subtle to massive changes in the functions of the nervous system. In this modern era, these drugs are unfortunately becoming an important necessity to so many people suffering from different mental ailments. They can differ in functions from taking pills to simply sleeping to tablets you need to process even little things in your day-to-day life. Especially during the horrendous times of corona, their use became excessive. I firmly believe to some extent they are necessary as well, for the normal

functioning or at least the mere survival of a few agonized troubled individuals. No qualms in accepting the fact that they are addictive and make a person dependent but still using an external substance to survive are far better than brutally ending or ruining your own life, through that engraved pessimism and enhanced exhaustion of yours. So, it is better to take one or two tablets daily than to become a threat to yourself and to those who are around you. Though still their use can never be justified from religious, societal, and human perspectives as well, I believe there is nothing more precious than an ailing human life deserving to get out of that long, deep, ghastly whirl of discomfort, uneasiness, and qualm at all the costs and in all the conditions.

All in all, it's an undeniable fact that human emotions play an important role in maintaining a healthy, balanced life. A person with a high emotional quotient will surely have better control over life than a person whose emotional intelligence is not satisfactory, and it is astonishing yet amazing how these emotions of different dimensions and alternating domains are delicately and effectively controlled by various Neurotransmitters.

Future of Pakistani Chemistry Graduates: Opportunities and Challenges
Izaz Ahmad

As our world becomes increasingly complex and interdependent, the study of chemistry has never been more important. From developing new medicines and technologies to addressing pressing environmental issues, chemistry plays a critical role in shaping our future. But what does the future hold for chemistry graduates? In this article, we will explore the opportunities and challenges facing chemistry graduates and what they can expect as they enter the workforce.

Pakistan has a rich tradition of producing talented and highly skilled chemists, and the future of Pakistani chemistry graduates is promising, with many exciting opportunities and challenges. However, some specific factors will shape the future of chemistry graduates in Pakistan.

Opportunities

One of the most promising areas for Pakistani chemistry graduates is the pharmaceutical industry, which is growing rapidly in the country. With the increasing demand for affordable and effective medicines, there is a growing need for chemists with expertise in drug discovery and development. In addition, advances in synthetic biology and biotechnology have opened up new opportunities for Pakistani chemistry graduates in the development of new vaccines and treatments for diseases. Another promising area for Pakistani chemistry graduates is the energy sector, where there is a growing demand for clean and sustainable energy solutions. Chemists are at the forefront of developing new methods for producing renewable energy, such as solar and wind power, as well as developing new battery technologies. In addition, the development of biofuels is seen as a promising alternative to fossil fuels, providing new opportunities for chemistry graduates in Pakistan.

In the field of materials science, Pakistani chemistry graduates have the opportunity to work on the development of new materials with unique properties, such as superconductors and graphene. These materials have the potential to revolutionize a wide range of industries, from electronics to transportation.

Challenges

Despite the many exciting opportunities, Pakistani chemistry graduates also face several challenges as they enter the workforce. One of the biggest challenges is the limited number of jobs available in the field, as many companies are not able to provide adequate employment opportunities for recent graduates. In addition, many companies are not able to offer salaries and benefits that are competitive with international standards, making it difficult for recent graduates to establish careers in the field.

Another challenge for Pakistani chemistry graduates is the lack of investment in research and development. With limited funding available for scientific research, many chemistry graduates are unable to pursue careers in cutting-edge research and development, which limits their opportunities for professional growth and advancement.

In addition, the rapidly changing nature of the field of chemistry also poses significant challenges for Pakistani chemistry graduates. As new technologies and techniques are developed, chemistry graduates must stay current with the latest developments to remain competitive in the job market. This requires a commitment to lifelong learning and a willingness to continuously adapt to new technologies and approaches.

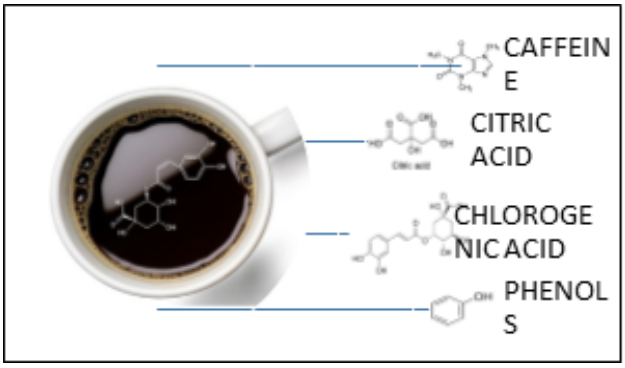
Conclusion

The future of Pakistani chemistry graduates is promising, with many exciting opportunities in a wide range of fields. However, there are also significant challenges that chemistry graduates must be prepared to face, including limited employment opportunities,

limited investment in research and development, and the rapidly changing nature of the field. To succeed in the future, Pakistani chemistry graduates must be dedicated to lifelong learning, be willing to adapt to new technologies and approaches and find work that is meaningful and fulfilling. Despite these challenges, there has never been a more exciting time to be a chemist in Pakistan, and chemistry graduates have the opportunity to make a positive impact on society and create a better future for all.

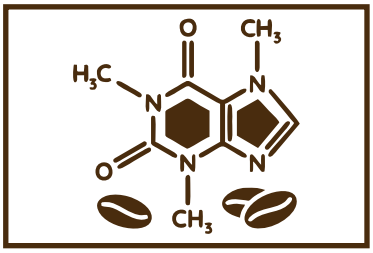
Coffee in a Chemists View
Rabiyah Nadeem
0229-MPHIL-CHEM-21

COFFEE! CAFFEINE! CHEMISTRY! All staring from the letter C. Your morning pick-meup does a lot more than just pulling you out of that Monday slump. Everything from the bitter taste of coffee to the buzz it gives you is caused by a complex play of chemistry beneath the surface. One of the most predominant central nervous system (CNS) drugs that fall in the category of xanthine chemical groups is caffeine (Tri-methylxanthine). Also known by the name caffeine, theine, mateine, guaranine, and methyl theo bromine were discovered by Mr. Pierre Jean Robiquet while studying the medicinal properties of coffee.

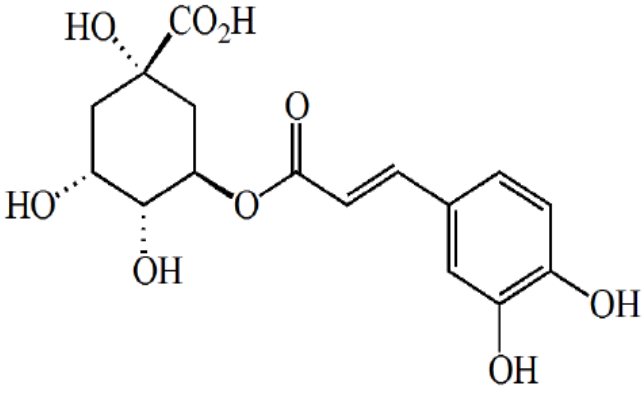


What is in your Cup?
Your cup of coffee is a cornucopia of a bunch of chemical compounds. When combined they create a bitter, aromatic, and strong fragrant cup with an antioxidant effect that provides us with a boost of energy.

Why is Coffee Bitter?

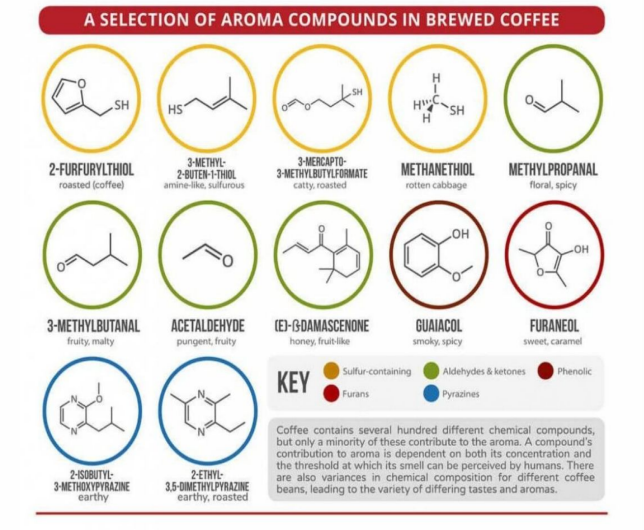


Unroasted coffee is composed of 8% of 40 different types of Chlorogenic acids. The bitterness of coffee is accounted for by the presence of 5-CAFFEOYLQUINIC ACID that converts into quinolactones, phenylindanes, and melanoidin's upon roasting.



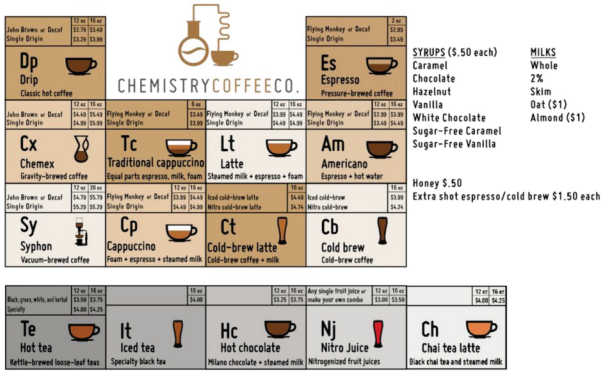
The Caffeine Content of Your Coffee
When drinking coffee the most important point to be kept in mind is the caffeine content in one mug of coffee. It is roughly estimated that one mug contains 100mg of caffeine. And within 15-45 minutes of consumption, the caffeine starts to work by blocking the Brain chemical adenosine that controls the tiredness in our body.

The Aroma of Coffee
Unroasted Coffee beans contain several hundred types of compounds, out of these only a few minority accounts for the aroma of coffee. The taste and aroma of coffee depend upon the concentration of various such aroma-causing components.



Arabica Coffee Vs Robusta Coffee

The two main types of coffee beans available to us today are as follows;



The Periodical Classification of coffee (ChemistryCoffeeCo.)



Arabica coffee beans (70% of world's coffee) are coffee beans superior to the Robusta type used to brew fresh, sweet, aromatic, and mild coffee. Flavor; mild bitter, sweet and highly aromatic. Growth Altitude 600-2000 meters. Sub-Tropical climate, lots of moisture, sun and shade required. Expensive; highly expensive. Caffeine level; low



Robusta coffee beans being more bulky in shape, highly bitter, and having a sharp earthy taste to it.
Growth altitude being 200-800 meters. Expensive; very cheap to buy and cultivate. Caffeine content being twice as compared to that of Arabica. Flavor; being slightly bitter.

COMMERCE & FINANCE



TIMELINE

January, 2022

US stock market reaches record highs; US federal reserve increases interest rates; International Accounting Standards Board launches Global Audit Plan; Ecommerce Revenue reaches record highs; Alibaba launches online marketplace in India; State Bank of Pakistan (SBP) launches Digital Currency Pilot Program

February, 2022

Goldman Sachs launches new online bank; China announces plans to launch new cryptocurrency; European Union establishes Digital Taxation Framework; Alibaba unveils grocery delivery service in Japan; Financial Action Task Force (FATF) removes Pakistan from the grey list; The State Bank of Pakistan (SBP) announces its commitment to implementing the FATF's recommendations.

March, 2022

Microsoft and Alibaba forge Strategic Partnership; Goldman Sachs launches Robo-Adviser Platform; China adopts new International Financial Reporting Standards; Pakistan Stock Exchange and Beijing's Shenzhen Stock Exchange sign MOU for Accusation of Trading & Surveillance System; The State Bank of Pakistan (SBP) releases a new set of regulations for Credit Unions and Financial Cooperatives.

April, 2022

OpenAI develops autonomous automation platform; JP Morgan Chase introduces AI-powered Trading Platform; Apple opens first store in India; Google introduces Payment Platform in China; Financial Regulatory Authority established in Azad Jammu & Kashmir; The State Bank of Pakistan (SBP) announces plans to launch a National Payment Platform to facilitate e-commerce.

May, 2022

Elon musk unveils Tesla's Autonomous Electric Truck; Bank of England introduces Virtual Banking System; International Accounting Standards Board publishes Updated Revenue Recognition Standard; China Mobile launches 5G Network; The State Bank of Pakistan (SBP) begins consultation with stakeholders on a proposed Banking Sector Consolidation.

June, 2022

Amazon introduces Internet of Things (IoT) Platforms; World Bank develops Digital Payment Platform; US Securities and Exchange Commission implements new Financial Reporting Requirements; WeChat rolls out unified payments system across Asia; The State Bank of Pakistan (SBP) introduces new rules to extend access to credit by small businesses

July, 2022

Facebook launches Augmented Reality Platform; VISA introduces Blockchain-based Payment Service; Financial Action Task Force (FATF) introduces anti-Money Laundering Guidelines; UPS introduces drone Delivery Service; Amazon launches fulfillment center in Pakistan; India's National Payments Corporation of India launches UPI platform; The State Bank of Pakistan (SBP) issues new guidelines to reduce Personal Loan Lending Risks.

August, 2022

Apple unveils next-generation smartwatch; UK government launches Digital Currency Task Force; G20 Economies agree to strengthen Multilateral Tax Cooperation; Shopify launches Automated Inventory Management System; eBay introduces AI-driven Recommendation System; Bank Indonesia (Indonesia's Central Bank) begins testing Digital Currency; The State Bank of Pakistan (SBP) announces the launch of a Mobile Banking App.

September, 2022

Uber and Nuro sign a 10-year Autonomous Robot Delivery Partnership; Microsoft launches Blockchain-as-a-Service Platform; European Union implements Corporate Tax Transparency Directive; Twitter updates Advertising Platform; PayPal launches Global Payment Network; South Korea's Samsung Pay expands into Malaysia; The State Bank of Pakistan (SBP) launches an Online Foreign Exchange Platform.

October, 2022

Google launches Quantum Computing Platform; IMF and World Bank launch Global Financial Safety Net; World Bank publishes New Accounting Standards for Developing Economies; International Accounting Standards Board launches Fair Value Measurement System; Facebook enables Personalized Shopping Experiences; The State Bank of Pakistan (SBP) approves the establishment of New Islamic Banking Institutions.

November, 2022

IBM develops AI platform; Barclays launches Crypto Trading Desk; US Treasury Department submits report on Tax Evasion Abuse; National Bank of Pakistan introduces Digital Banking Services; Apple unveils next-generation online storefront; The State Bank of Pakistan (SBP) updates its Regulatory Framework for Money Transfer Services.

December, 2022

SpaceX launches World's First Space Hotel; SWIFT launches Real-Time Payments System; United Nations establishes Global Accounting Alliance; Pakistan Stock Exchange (PSX) launches Automated Trading Platform; The State Bank of Pakistan (SBP) announces the launch of a New Instant Payments System.

ATOMIC HABBITS

Atomic Habits: An Easy and Proven Way to Build Good Habits and Break Bad Ones, by James Clear, is a comprehensive guide that provides readers with a new perspective on how to develop lasting habits that drive long-term success. Clear's approach is based on the concept of atomic habits, which emphasizes the importance of making small changes to one's behavior over time to achieve big results. The author uses real-life examples and scientific evidence to support his arguments and provides practical advice that can be easily implemented in daily life.

Clear explains that habits are the building blocks of successful lives and that developing good habits is key to personal growth and fulfillment. He breaks down the process of habit formation into four stages - cue, craving, response, and reward - and provides strate gies for influencing each stage to create habits th at stick. He also focuses on the idea that habits are not binary, good or bad, but rather exist on a spectrum, and provides techniques for transforming negative habits into positive ones.

Atomic Habits is an insightful and engaging read, and Clear's writing style is accessible and easy to understand. The book provides a roadmap for readers to develop habits that align with their values and goals and equips them with the tools necessary to o vercome obstacles along the way. The author's empha sis on the power of incremental progress is particularly noteworthy, as it provides a fresh perspective on how to approach habit formation.

In conclusion, Atomic Habits is a must-read for anyone looking to improve their lives through the development of good habits. Whether you're looking to establish a new habit or break an old one, this book provides the guidance and support you need to achieve your goals. With its focus on practicality and evidence-based approaches, it's a valuable resource for anyone looking to make meaningful changes in t heir life.

(ALI SAQLAIN – 0917-BH-BAF-19)

The Role of SMEs and the Impact of Digital Marketing on the Growth of SMEs in South Asian Economies.

Wajahat Naeem
0920-BH-BAF-19

Marketing has always remained crucial for small and medium-sized enterprises, but it is becoming more difficult due to global inflation. The cost is higher for orthodox marketing. Sooner or later, it will be getting out of SMEs' range. Customers are also not satisfied with this medium of marketing. Also, it does not provide satisfactory or desired results for SMEs.

Digital marketing is also known as web marketing or internet marketing which uses related digital technological means and the internet to achieve marketing goals and promote marketing, it helps to enhance customer relationships, delivery of quality services, and supply chain management. The high level of interconnectivity has eradicated conventional marketing techniques and proved that digital marketing is more influential to businesses and the economic development of any country in the world.

For an enterprise with no social media presence, the chances are that the consumer is not using that product. SMEs do not use these new digital marketing techniques. Social Media platforms help SMEs prosper their business and remain in the competition. It must be noted that two-thirds of all private sector jobs in the USA employees are SMEs. It is reported by World Bank and OECD that small businesses play a critical role in sustainable development goals. SMEs reduced poverty in third-world countries and played an important role in developed countries.

In past decades, Small and Medium Enterprises have played an impactful role in the economies of South Asian countries. The SMEs of Malaysia helped the economy to stand on its own feet. In GDP, the part of SMEs' income is slightly less than the contribution of higher income businesses. SMEs created employment for women and youth. It also participates in the stabilization of the economy of a country during an economic crisis. In the past, the policymaker and Politicians had often ignored the fact that 80% of the workforce belongs to the SMEs of south Asian countries. They had a significant role in the growth and environmental sustainability of South Asian economies.

IFC reported that access to financing for almost nine million formal small and medium enterprises is insufficient. Another obstacle is a lack of talent. The smaller loans have a high administrative cost as a percentage of the loan, resulting in low confidence of banks in lending money to SMEs for which they require collateral from the borrower. These SMEs usually lack legal identification and registration documents to meet the banking standards of South Asian countries. This gap ultimately alleviates the room for borrowing from SMEs. SMEs do not have proper accounting standards and poor financial management in business, which proves that some SMEs had not had any access to the local financial institution in South Asian countries. There are many other challenges for small startups to do business, for example, no access to financing, restricted coverage, high collateral demand, and if they borrow money through informal channels, the cost of their loan increases. Countries like Uganda, Kenya, Tanzania, Ethiopia, Bangladesh, Pakistan, and India these seven nations have the highest percentage of people without bank accounts. In South Asia, small startups do not even have a bank account.

In Pakistan, the government and administrative body of the country had not made policies in the last fifty years which could help to grow the small-medium size enterprises in the economy. The SMEs of Pakistan with 20% of the investment generates 30% of the GDP and 80% of non-farm jobs. Employment increased by 20% the government had not realized the potential of this sector and our future growth of the economy relies on it. There has been a lot of contribution of SMEs to the Indian economy and had coherent features of employment policies and industrial factors since 1970. It is a positive sign for the growth of the economy and small businesses. Sri Lankan government is trying to create jobs by implementing the policies of the Tenth National Development Plan. Nepal has always valued its SMEs. The facts describe that about 98% of employees are in SMEs. 80% of the production of goods comes through small-medium size businesses and get 40% investment of all businesses. The research was conducted to find the relation and impact of digital marketing on SMEs in South Asia it was based on an online questionnaire survey and 47 replies from 50 respondents. Providing a response rate of 93%. The population was composed of clients of Faheem Hayder Dealing as well as employers. The aim was for digital marketing allows to boost the sales of SMEs in south Asia and ultimately grow the SMEs in south Asian countries. The result of statistical tests shows that a positive and a significant have given a level of significance at 1.00%. It means that the correlation coefficient which is positive and significant at the 1% level. It shows a strong relationship between the growth of SMEs and digital marketing.

Effect of Entrepreneurship on Economic growth
Rija Dawood
0726-BH(E)-BAF-19

Entrepreneurship is one of the fastest-growing phenomena, helping societies around the globe, with economic growth. It boosts the progress of society through the creation of wealth and employment, lifestyle. According to GEM (Global Entrepreneurship Monitor), which measures the activity of entrepreneurship in 59 countries In Pakistan, the new business ownership rate is increasing from 2.7% to 4.7% and the total early entrepreneurship rate activity is 9.08%. According to GEM, Pakistan's young entrepreneurs and business leaders have lower growth targets, when compared to other countries. Also, Pakistan has 27.73% of the total working-age population, including entrepreneurs. It is believed that fear of failure is the biggest factor, discouraging them from starting a business. Pakistan ranks 136 out of 190 countries in the entrepreneurship index, the second lowest score in Asia and the well-developed middle east. To determine the stature of economies, GME conducted research. There are three categories i.e., Factor-driven economies, Efficiency-driven economies, and Innovation-driven economies. According to the results, Pakistan was characterized as a factor-driven economy. Results indicated that Pakistanis have lesser reliance on entrepreneurship than those people who are living under similar conditions of economic in other countries. Under the current economic crisis in Pakistan, the growth is still moderate because the majority of people are focused on their job, trying to meet both ends, instead of opting for entrepreneurship Another reason is the high rate of unemployment. unemployment. Unemployment is a global issue, especially in developing nations like Pakistan. Entrepreneurship affects the overall economy in several ways. Entrepreneurship is important because it can act as the wheel of a country's economic growth, keeping more than a billion people working, creating jobs, and helping economies grow around the globe. Entrepreneurs generate a significant number of entry-level jobs, providing freshers to be a part of a professional environment and therefore, converting those unskilled workers into competent ones. It also trains and provides big opportunities to experienced workers. Entrepreneurs produce new innovative solutions, backed by ideas, through the appropriate research and development techniques. This opens the door for new technology markets, advanced products, and new business domains. Along with that, these R&Ds may help enhance the production of existing goods and resources in the most effective ways. The process of providing newer solutions to older problems may have a huge economic impact on economies and help them grow rapidly. A prime example of this is China, which became the world's 2nd largest economy in the last 2 decades.

Entrepreneurs not only create jobs for themselves but also for other people. By introducing innovative goods, techniques, and manufacturing processes to the market and by increasing overall productivity and competition, entrepreneurial activities may have an impact on a nation's economic performance. From the hiring of new workers to the enhanced GDP, from getting the income to spend in the economy, and paying taxes, everything contributes to the growth of the economy. The creation and then circulation of wealth between different segments of society can improve people's lifestyles. Entrepreneurship may also help in the betterment of the environment. Start-ups regarding greener technologies can help in combating environmental hazards. Such start-ups are already working in Pakistan. These clean start-ups attract foreign investors, looking for long-term sustainable investments. A country like Pakistan always needs new start-ups that can attract higher finances in the form of foreign investments. Along with all the economic growth, entrepreneurship can help a person attain personal growth as well. An entrepreneur can be benefitted by achieving a work-life balance, through the entrepreneurial mindset. An entrepreneurial mindset is a way of thinking that directs behavior toward entrepreneurial activities and results. People with entrepreneurial mindsets are frequently attracted to opportunities, innovate, and create new value while also accepting associated risks and the realities of change and uncertainty. The mindset of overcoming the older hurdles in a new manner can help a businessman be more successful in life. Researches reveal that an Entrepreneurial mindset affects positively and significantly the performance of SMEs and parameters include: seeking opportunity, creativity, innovation, risktaking, pro-activeness, and alertness to take action. It can be settled that the higher the entrepreneurship competence possessed by the entrepreneurs the greater it is for their business to succeed in SMEs. The competence component includes opportunity, innovation commitment, conceptualization, capability to effectively manage the use of resources, relationship competence, and strategy, which significantly affect performance.

In conclusion, the promotion of entrepreneurship has a positive effect on lifestyle, economic growth, and even surviving businesses, Entrepreneurship is helpful, not just for the reduction of unemployment but for higher economic growth as it involves substantial thinking, better ideas, enhanced products for an improved

lifestyle and higher economic income. In this way, social changes gradually impact global and national changes. So, the importance of entrepreneurship is much valued.

Digital Payments: A Global Perspective
Ali Saqlain –
Roll No. 0917-BH-BAF-19

Digital payments have transformed the way people pay for goods and services. It has also changed how merchants accept payments. Digital transformation has dramatically reshaped consumers' buying habits and the way they pay. Today, consumers expect to be able to pay with the device of their choice when they want and where they want. New digital payment solutions have emerged, including mobile wallets and mobile payment apps to fulfill these needs. These solutions are advanced and secure, thus providing a sense of security to the consumers. Some of the significant trends in this space are discussed below.

Firstly, a virtual currency is a digital currency used to purchase goods and services in a virtual environment, such as the internet or virtual reality (VR). In first-world countries, a growing number of people are using virtual currencies. A prime example is Bitcoin as a payment method. In 2009, the first virtual currency, Bitcoin, was created. The currency was grounded on Blockchain technology based on cryptography, where cryptographic codes are used to record and protect the data. These codes can be altered by the people who control the blockchain database. Transactions can also be verified by other parties, who use the blockchain to check whether the transaction was recorded correctly or not. This technology has been used in many industries to record transactions. Blockchain technology has become increasingly popular, with companies like PayPal and Google using it for payments. It is also being used in some industry sectors including real estate and healthcare, to ensure the completion of transactions hassle-free. This technology allows people to make payments with low or no fees. It is also decentralized, meaning no single institution controls the currency. The advantages of Bitcoin, as a payment method are balanced by its limitations. For example, its value is super volatile. That makes it less suitable for everyday purchases of goods or services. But over time, the rise of blockchain – the technology behind Bitcoin – has opened new doors. For example, this technology is used in other applications like supply chain management.

The overwhelming usage indicates that virtual currencies have taken on a new role in the payments industry—they are increasingly replacing traditional fiat-based systems for payment processing and financial transactions, leading to enhanced problems and challenges for traditional payment providers and financial institutions.

If we talk about banking cards, every time you pay with them, you take out a credit line from the issuing bank. Interest charges are also incurred from the day of purchase if you don't pay off the total amount at the end of the month. Some cards also charge annual fees. However, these cards still serve the purpose of payment better than cash. Cash has become a less common payment method in many places. That has left consumers looking for other ways to pay for things. There are several reasons for this. Digital payments are often cheaper than cash. They can also be more convenient, particularly when making purchases online. In addition, digital payments have become more sophisticated over time. The most sophisticated of them all is the payments app. Mobile payment apps are booming. Around the globe, these apps account for a large share of all digital payment solutions. But not all mobile payment apps are created equal. Some apps allow you to store your payment information for quick and easy payments. Some apps also allow you to manage your receipts, providing usefulness because you can easily track your spending. In addition, some apps have more advanced security features than others, depending on how they store your payment information. There are two main types of mobile payment apps: wallets and payment apps. Wallets are apps that store your payment information and allow you to make payments with a single tap or click. Payment apps, on the other hand, can be linked to your wallet or bank account. They are often used to make person-toperson payments.

All these mobile payment apps are using a unique way to authenticate the transactions of the users by using biometric technologies. Biometric technologies are increasingly being used in digital payment solutions as it measures and analyze people's physical and behavioral characteristics to identify them, whether by scanning the retina of an eye or scanning the veins in a person's hand. There is no one type of biometric technology. This kind of authentication revolutionized the digital payment industry as it augments security, providing an additional layer of protection to these apps. It can be used at various stages of the payment process. Biometric authentication can be used to replace or supplement passwords or PINs. It can also be used to authenticate customers or prevent money

laundering. It can even be used to verify if a person has sufficient funds in their account to pay for goods or services.

Digital transformation has restructured the payment behavior of shoppers. Digital payment solutions have become an integral part of almost every transaction. With the invention of ever changing technologies, there lies a future of virtual currencies ahead of us. Also, payment through mobile phones is convenient and easier to use.

Rise Of Artificial Intelligence & Fall Of Human Jobs

Zoha Shahid
0712-BH(E)-BAF-19

Life has been becoming easier and easier since Charles Babbage invented the first computer. We do our multiple tasks with the help of machines. Technology has changed our lives and continue to do so in near future. The fifth generation of computer ***"Artificial intelligence"*** is on its road to success for the past decade. A road whose destination is still unknown and unpredictable. It all started with computer programs that simulate human intelligence in machines which can result in machines thinking and acting like human beings. It is unlike natural intelligence which involves consciousness and emotionality, and it is demonstrated by machines. These machines mimic different cognitive abilities that are associated with human minds. Artificial intelligence can rationalize and take actions that have the best chance of achieving a specific goal. It has its advantages and disadvantages. Around us, almost every industry is using artificial intelligence which helps them to get their task more conveniently and quickly. Technology is a long-term investment like a fixed asset, so it reduces future costs. Using technology rather than hiring employees reduces our costs by eliminating daily or monthly wages or salaries. Plus, it reduces errors and mistakes. If programs are built strongly, computers can be more reliable than humans. Computers become more efficient with time, so there will always be innovations in the future. Now, let's shed some light on the cons of artificial intelligence, its powerfulness makes humans weak. It has many negative impacts on human psychology like accessing or attaining everything without any physical moments can make humans lazy and limit their cognitive abilities. Also, there could be a misuse of artificial intelligence by hackers and terrorists. The most unhighlighted con of AI is its effects on the job force. We all know that unemployment is referred to individuals who are employable and actively seeking a job but are unable to find a job for several reasons which results in a severe financial, economic, and emotional loss. It is a serious emerging issue with many roots. If we talk about artificial intelligence and unemployment collectively. We can easily figure out that machines are replacing human jobs. AI is causing great disruption in the employment rate. Automation has been changing the job landscape for many years and it only seems to be expanding in years to come. Routine manual and cognitive jobs are being declined and replaced by machines due to technological development. The employment rate is falling and it is causing economical and financial loss. This kind of unemployment caused by AI is called ***technological unemployment.***

It is alarming how the current generation is dependent on these gadgets and enjoying the ease that comes with them, not knowing it has the power to rule them. It is somehow in human nature to develop and make things easy. For instance, means of transportation have been altered from traveling on foot to using animals for traveling and then using bicycles, cars, and planes for these purposes. It seems impossible to stop artificial intelligence from expanding as the human race can't stop to simplify things.

We should know that if we are not careful, technology can kick us out of our workplace. Study shows that AI will displace ***75 million*** jobs in the coming year. Laborchanging technology is displaced by machines and makes the poor poorer. Technological unemployment is not because of fluctuations in supply and demand but it's because of a gap in human skills and machine skills.

According to statistics, artificial intelligence is expected to create 28% more jobs but it's more likely that it's currently destroying 26.2% of jobs. The primary goal of technology development is to grow economies by creating jobs. It all depends on strategies used by policymakers that how well and how much artificial intelligence will affect the job force. Higher authorities should consider mostly technological development that can create further jobs. Also, we can train ourselves not to be crushed by computers. Even computers need modification, upgradation, and maintenance. We need to have technical and operating skills to survive in this modern age. Certain jobs are created by technology development, organizations should try to train workers for those jobs rather than displacing them with machines. By focusing on the bright side, we can see many jobs in the market like social media managers, digital marketers, application

developers, content creators, and many more; the new generation should set their career choices wisely by considering that either their dream jobs going to benefited by technological development or crushed by it. Policymakers should make policies that make technology unemployment into technology un(der)employment. In other words, we should be the controllers of machines and not let them control us. The technicality of labor should align with the technology used in the respective industry. All of it will help the human workforce to accumulate with technology development rather than depreciate.

COMPUTER SCIENCE



TIMELINE

January, 2022

UMass Amherst researchers developed a low-cost technology that uses human body energy to power wearables by harvesting waste energy from Visible Light Communication, a 6G technology.

February, 2022

Universidad Carlos III de Madrid researchers created a computer vision system for automatic analysis of biomedical microscopy videos, characterizing and describing cell behavior in the images.

March, 2022

University of Cincinnati researchers predict that advances in computer chip technology could enable the creation of synthetic life through the manufacturing of genes, as there are similarities between computer programming and gene synthesis.

April, 2022

University of Tsukuba researchers have created a metallic waveguide with a tiny cavity that can selectively choose specific wavelengths of light, potentially leading to light-based computing devices instead of electricity.

May, 2022

MIT researchers created a path-planning system for autonomous vehicles that can navigate unpredictable environments, including changes in obstacle size, shape, and position, to ensure safe travel from one point to another.

June, 2022

Researchers at Rice University have created a program that involves human interaction to improve the motion planning abilities of robots in environments with obstacles.

July, 2022

The NC 2022 conference focused on computer networks and communications, bringing together researchers and practitioners to collaborate and explore advanced networking concepts.

August, 2022

Rice University's ROBE Array offers a low-memory solution for deep-learning recommendation systems, making AI more accessible to smaller companies. This innovation was announced on August 29, 2022.

September, 2022

Delft University achieved full control of a six-qubit silicon-based quantum processor, improving scalable quantum computer development with a new chip design and automated calibration, and low error rates.

October, 2022

The IEEE Future Networks World Forum brought together experts to exchange advancements in future networks beyond 5G through cross-domain studies and pilot showcases in Montreal.

November, 2022

SC, an international conference on high-performance computing, networking, storage, and analysis, took place in Dallas. Participants presented new research and competed for peak performance.

December, 2022

CCCIS 2022 in Singapore was a conference focused on computer communication and information systems, with a goal to promote technological innovations and identify opportunities and challenges for future development.

Quantum Computing
Hafiz Syed Zain Ali Shah
0151-BSCS-20

Humankind's evolution begins with the incredible invention of the computer. From time to time, we enhance its computational power by increasing the fundamental element of the "transistor". We start from the evolution just from the enormous size with small computation capacity and now due to the small size of transistors, we attain the level of supercomputers. Now our requirement is more. But the problem is we reach the maximum tiny size we could achieve for the transistors, and we are unable to small it furthermore. As well as some of the computational complex problems require a lot of time even the supercomputer is unable to produce results in a reasonable time slot. And many of today's complex query solutions are unable produced by traditional computers (classical computers). To overcome this limit, we come to the physics field named quantum physics. That causes the evolution of quantum computing. The knowledge of quantum computing is the hope and will be the new revolution for this world. I know many minds think this is the upgradation, some enhancement, or the new generation of today's classical computer. But before we move further this is important to discuss that this is entirely different from traditional computational computing. This is like the difference that exists between the electric bulb and the oil lamp. In the 1980s the scientist Richard Feynman comes to the barrier that is not possible to overcome by classical computational logic. So, he analyzes very carefully and got to the point of superposition. This is a remarkable knowledge that he discovers. A Quantum computer is a technology that runs on qubits. Same as today's computers which are operate on the fundamental phenomena of the bits which will be "0 OR 1". But this is the turning point that the Qubit can either be "0, 1, OR both" at the same time. Yes, this is the craziest and most revolutionary fact behind it. The state in both possibilities of becoming "0 or 1" in a Quantum Computer refer as a **superposition**. We don't know at any point whether the qubit is 0 or 1 because here is the third state also available in which both of the possibilities exist in some proportions. Quantum computing comes from quantum physics which deals with particles. The quantum computer performs the task by controlling the behavior of such particles (electrons, protons, etc.). From this superposition concept, the one other thing also resolves is the storage factor. As we know qubits can be both at the same time but on the opposite, the classical bits can be either 1 or 0 but not both. So, the quantum bit can store the 16 maximum combinations of 4-bit numbers at the same time with the same resources. But the classical 4-bit number only represents the only 4 bits of that particular number from the start to the end of the processing. This thing is quite tricky to understand. But this is only becoming possible due to the Qubits. The solution comes from the Quantum Entanglement using Qubits. Which ties up the Qubits and made the best combination for the correct results. This is such a correlation that's equivalent and doesn't exist in the non-quantum world. These events are extremely sensitive and can be disturbed by little unfair environments. So, we have to keep several copies of the information to tackle any undesirable situation. Hence, we attain the maximum possible best situations for it. This is worth it that the results stay for an extraordinarily little period. This brief period refers to the "Decoherence time". This is different for the different types of Qubits. The Qubits exist in several types. The most wellknown is the superconducting Qubit. This bit we generate from the same procedures that are present in the computational industry before but with remarkable results in the form of superconducting Qubits. Others are ion traps (ions with a positive charge used for them), photonic Qubit (works on the Qubits that have the resemble properties that of the photons), etc. All of these bits exist with different conditions of temperature and size. This is noticing that the quantum computer works at exceptionally low temperatures. Their temperature is always kept low in the different Qubit types but the ranges might be different from each other. As we all know that logic gates are a very essential factor in today's computing. Same as it, a Quantum computer uses a Quantum gate. This manipulates the Qubits in such a way that the one particular superposition state to another useful superposition state so that after manipulating it we get the correct and reliable computational results. Quantum computers use in many of the multiplex industries which are at some point undefinable due to in-terms of (time taking, and complexity) of traditional computers. We know from the beginning of the computational era that protection is our priority. But due to shortcomings of the industry, we are unable to supply a secure environment for our information. From quantum computing, we are now able to tackle these issues with a perfection rate just due to the superpositions of the Qubit. If any Hacker wants to hack information private keys. The qubit doesn't allow it because we know that there are a lot of possibilities for the numbers. Just 4-digit Qubit has a maximum of 16 combinations of superposition. So, this is impossible for any human to crack all the possibilities for the security keys. Just like that, the medical industry has many compounded problems, involving proteins etc., making it hard to find accurate outcomes. And today's computers are unable to predict these problem solutions else than a quantum computer.

The internet's massive neural linking is also now discussable and more understandable than in the past. So, we yet can find many of our mysterious phenomena answers by using the power of Quantum computing. Now, this is our turn to contribute to this industry for the betterment of mankind.

Why should people care about Web 3.0?
Afraz Asher Asrar
Roll N0. 0303-BSCS-19

In the early 1990s, the web was invented by a computer scientist named Tim Berners-Lee. At that time, he was working at CERN as a researcher. He created the three fundamental technologies that became the foundation of the web. HTML, URL, and HTTP. The Internet of that time was different from the internet that we know of all the webpages were static and had only text-based content. Most internet users at that time were delighted by unique features such as email and real-time news retrieval.

Then web 2.0 came, which we all are familiar with in today's time. Web 2.0 was introduced in 2004 and is referred to as the second generation of the World Wide Web. Web 2.0 heavily focused on social connectivity, interactive web pages, responsive design, and user-generated content. This kind of interactive content reached millions of people all over the world virtually instantly through the internet; this unmatched reach has led to an explosion of this type of content in recent years.

The reason behind this exponential growth of web 2.0 is mobile cellular devices. If we conduct a survey in 2022 about "how many people own a cellular device and use the internet on it?"; we'll get an approximate number of 15 billion people in the world. Some people own multiple cellular devices including smart watches, smart home devices, and more. The frequent use of cellular devices has enabled the dominance of data-driven applications that have online interactive and utility features. Examples, are Facebook, Instagram, WhatsApp, Uber, Reddit, TikTok, and YouTube, to name a few.

This dominant growth has made their platforms among the biggest Web 2.0-centric companies in the world. Both concerning market capitalization and the gig economy. They have enabled millions of people to earn income on a part-time or full-time basis by driving, delivering food or goods, selling goods and services online, or working for the companies themselves. There are many pros and cons of web 2.0.

Pros:
- It helps in marketing by supplying free online resources.
- Virtual interaction: people can increase their friend circle through social media.
- Educational content: people can write or share educational content, which can be accessible by people free of cost.

Cons:
- Fake content and hackers.
- Centralized servers, can be an easy target for hackers.
- No proper ownership and governance.

The next step in the evaluation of Web infrastructure is Web 3.0. Web 3.0 is the next iteration, the next generation of the World Wide Web. This next generation of the web has the potential of being disruptive, and groundbreaking, and to be considered the next big paradigm shift in Network Technology. This latest version of the web is based on core concepts of decentralization, ownership, openness, and fair and fraud-free working.

A similar concept was presented in 2001 by Berners-Lee "The Founder of the World Wide Web". In his paper, he talked about the "Semantic Web". The semantic web is a concept in which the computer will be able to understand the written text and give the user a better answer. The problem with the semantic web is that computers have no reliable way to process the semantics of a language but with the emerging development in Artificial Intelligence and machine learning, this concept is more than possible to achieve. That's why web 3.0 has moved beyond the original concept of the Semantic Web.

One of the main core concepts of blockchain is decentralization, decentralization means no central authority and no central controlling node, which implies freedom from surveillance. Another thing about decentralization is that the user data will be stored in multiple databases instead of a single centralized database, which can lead to no single point of failure. This will overall improve the security vulnerabilities that exist in our current system. It will decrease the rate of hacking that people face daily. Hacking a decentralized application or network isn't impossible but it is hard because it requires a lot of computational power.

We can expect a symbiotic relationship between these three technologies: Web 3.0, cryptocurrency, and Blockchain. All these technologies exist because of blockchain. They will be seamlessly integrated, and automated through smart contracts, and will be able to power anything like a file-sharing application like Filecoin and more. Web 3.0 consists of many features, some of the main ones we have already discussed. All the major features are:

- Semantic Web
- Artificial Intelligence
- 3D Graphics
- Connectivity
- Blockchain
- Decentralized
- Edge Computing
- Ubiquity

Let me explain it with an example where all eight features come into play to create the nextbig revolution of web 3.0:

In Web 3.0, while driving, you would be able to ask your AI assistant a question: "I would like to go to a park for a walk and after that, I want to eat some Arabic food." The search engine embedded in the car assistant will provide you with a personalized response that considers your location, suggesting the closest park that matches your request and a good Arabic restaurant by automatically consulting the reviews on social media. Then it might even present a 3D menu from the restaurant on the display.

There are many pros and cons to web 3.0 because it's still very much in development.

Pros:

- People will have full ownership of their data.
- Users will be able to track their data, so they know that no one is using it in a harmful way. Users will have total transparency with their data.
- There will be no middleman in web 3.0. Companies will be able to directly connect with their customers. There will be fewer intermediaries in web 3.0.
- The web surfing experience will be personalized according to each user.
- **Cons:**
- It may be a bit complicated at first for beginners to understand.
- Existing websites will need to upgrade their whole
- It will be difficult to regulate because the decentralized nature of web 3.0 can lead to difficulties in monitoring and regulating Web 3.0, which can cause a spike in cybercrimes.

In conclusion, Web 3.0 is the next big thing in the field of information technology. It is more connected, open, and intelligent, with artificial intelligence, semantic web, distributed databases, 3D Graphics, block chain, and natural language processing. It will change the way that we use the internet in our daily life. It is much more secure than our current Web 2.0 but still, people fear Web 3.0 because it's untested territory. It will get better and more reliable as more people start using it or creating applications for it. If you are interested in learning Web 3.0, now is the time to do so.

ECONOMICS


ECONOMICS
GDP
FINANCES
REVENUE
INFLATION
VALORIZATION
GROSS DOMESTIC PRODUCT
EXPENDITURE WORLD ECONOMY
MACROECONOMICS MODEL
CALCULATION
DEAL
MONEY
LEASING
BUDGET
PROFIT
ECONOMIC
CHECK
CLOSING
CALCULATION
QUOTE
DVP
NETTING
INFLATION
BACKING
SCIENCE
INDUSTRY
DEPOSIT
MACROECONOMICS
FINANCING
LIQUIDITY
GROSS
PROFIT
MICROECONOMICS
ACCOUNT
ANALYST
LIQUIDITY
DEALING
CREDIT
DEVALUATION
CURRENCY
WORLD
ECONOMY
QUOTE
CALCULATING
INFLATION
GDP
BARTER
BACKING
ACCOUNT
NETTING
ENFORCEMENT
INDUSTRY
MACROECONOMICS
DUMPING
VALUE
VALORIZATION
REVENUE
ENFORCEMENT
CURRENCY
LAW
LOAN
CURRENCY
DUMPING
ANALYST
DEVALUATION
DEPOSIT
LEASING
INFLATION
BUDGET
CAPM
CLEARING
DEBIT
CLOSING
FINANCING
LIQUIDITY
DEFAULT

TIMELINE

January, 2022

The Regional Comprehensive Economic Partnership (RCEP), which took eight years to negotiate, was finalized on November 15, 2020, and went into effect on January 1, 2022.

February, 2022

The conflict between Russia and Ukraine, which started in late February 2022, increased the price of food and energy globally. On March 7 compared to before the war, prices increased by almost five times.

March , 2022

On March 8, the price of gold reached a new high of 2,078.8 USD/ounce. Geopolitical unrest and inflationary pressures have increased investor interest in gold, which was seen as a haven.

April, 2022

Prices for food and fuel have dramatically climbed, particularly harming low-income nations' most vulnerable people. In addition, the conflict's economic costs caused inflation to rise and the global economy to develop far more slowly in 2022.

May, 2022

The 52nd World Economic Forum Annual Meeting convened on 22-26 May 2022. The summit brought together the most influential figures from business, government, and civil society, with a focus on advancing collaboration to combat climate change.

June, 2022

Global stock markets see a dramatic decline. On June 6, the worldwide equities index known as the MSCI All Country World Index fell 21% from its record high of 597.64 points achieved in November 2021.

July, 2022

Due to downturns in China and Russia, global output decreased in the second quarter of this year, while US consumer spending fell short of forecasts. An already fragile global economy was hit by several shocks, including higher-than-expected global inflation.

August, 2022

The People's Bank of China is reducing the interest rate on some financial institutions' 400-billion-yuan ($59 billion) loans under its one-year medium-term lending facility by 10 basis points, to 2.75%.

September, 2022

Economic leaders from around the world were polled for The Forum's Chief Economists Outlook for September 2022 to gain insights into how they interpret the state of the world economy. With 73% of respondents stating that a worldwide recession is either very probable or highly likely, the prognosis is bleak.

October, 2022

Ben S. Bernanke, Douglas W. Diamond, and Philip H. Dybvig received the 2022 Sveriges Riksbank Nobel Prize in Economic on 10 October 2022 for research on banks and financial crises.

November, 2022

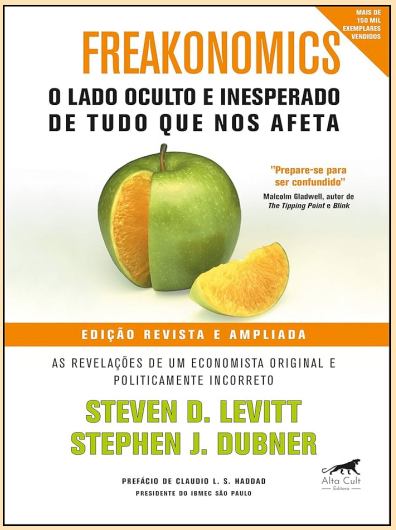
An agreement on climate change was approved at the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27), which was held in Egypt from November 6–20. There was a proposal to establish a "loss and damage" fund that would provide financial aid to developing countries affected by climate change.

December, 2022

Following four straight increases of 0.75 percentage points, the Fed increased interest rates by half a point on December 14. However, the central bank's policymakers anticipate raising rates more than they initially thought they would and keeping them there for a longer period.

FREAKONOMICS

Steven D. Levitt and Stephen J. Dubnerz



When it comes to economic non-fiction, Freakonomics by Steven D.Levitt; an economist the brain behind this incredible nonfiction who teamed up with Stephen J. Dubner, a wall street journalist, is a must-read. Levitt has been described as the most interesting mind in America by Malcolm Gladwell. Written in 2005, the book has been adapted into a documentary and a sequel has also been published. The book remains ahead of its time, being one of the first books to bring to light the combination of economics and data science. The book comprises 200 pages which give its readers a fresh perspective to look at the world around them. Steven D. Levitt has proclaimed himself as a rogue economist in the book who analyses various topics ranging from crime in American cities to the impact of parenting on a child's life. The book is very strongly opinionated, so much so that it might persuade the readers to ask themselves questions they might have never asked themselves before. The reader may end up pondering upon various views most widely and commonly known to the general public. Each chapter starts with a claim made by the authors. The readers may or may not agree with it, or even have their heads spin in confusion but the evidence is slowly built by the authors to support their claim. The authors have used statistical figures to back up their arguments. They used these figures to analyze and compare the similarities and differences on the ongoing subject to give the readers a remarkable point of view on how things work. This way the authors have proved their point at the end of each chapter. Each chapter is named as either a question or a comparison. For example, chapter 4 is titled “Where have the criminals gone?” and Chapter 3 is titled “Why Do Drug Dealers Still Live with Their Moms?” The book excels in opening new perspectives to its readers and guiding them on how the world works. The readers can't help but question the world around them. They learn how society works and how the actions and decisions of a single person affect other people living in that society. They realize that all aspects of the economy are not perfect. Freakonomics is a book that offers diverse perspectives on various scenarios, making it thoughtprovoking. The author's writing style is easy to read, making the book accessible for those who want to learn about economics and psychology. The book is perfect for beginners or those studying behavioral economics and can provide a fresh perspective on the world. However, the book has some negatives such as a self-congratulatory tone and a lack of economic context in some parts. The author also discusses African American children in a way that goes against the book's original theme. Overall, the book is a good read and offers a wider and better perspective on the world, but is more suited for education rather than entertainment. The author would rate the book 4 out of 5 stars.

ZARWA MAHMUD

Economics Of Addiction; Role Of Health Economics In Preventing Drug Abuse

Wajahat Usman
Roll No. 1001-BH-Econ-20

Economics is all about the study of human behavior when a person decides to fulfill his demands with his scarce resources. As far as the study of drug abuse and addiction to illicit substances is concerned, the role of biotechnology, psychology, chemistry, Mind sciences, and other relevant subjects cannot be ignored. Likewise, Economics has a pivotal role to play in it since, it is concerned with the central decision-making, policy framework, strategy, and evaluation of different models looking at the given conditions. It focuses on the price level, demand and supply model, tax and duty rate, the market structure of an item, and government policies. In this regard, Health economics is responsible for all the queries in terms of the subject we are discussing. Henceforth, Economics is all about studying the mind sciences of the consumer and producer in the market.

Drug addiction is an illness in society that keeps growing daily. Its consequences are highly negative regarding both; personal cost and external cost (Cost is the sacrifice made or the monetary value of anything that is purchased). In the context of the overall economic cost (it is the value you give up when you choose one economic activity over the other best economic activity), the United States costs 193 billion dollars in terms of lost productivity of labor, drug abuse treatment, healthcare cost, and criminal justice cost. There are two arenas in economic costs.

- Personal cost: this includes the individual's health and life.
- External cost: it includes two things

1. The resource cost of the substance used includes treatment and prevention, medical care, criminal justice, etc.
2. Loss of potential productivity and earnings of the businesses directly affect the country's economic growth and sustainable development.

The external costs, directly and indirectly, affect others through crimes, violence, divorces, or other antisocial behavior.

The cost of drug abuse can harm society in different ways.

I. It affects the users themselves by affecting their life, health, social, physical, and psychological costs.

II. It directly affects the other individuals who are passive smokers.

III. It affects the overall productivity of businesses due to production losses. This happens because the labor becomes ill, absent, and holds no interest in the work hours of the workplace.

IV. The government is affected by who funds the healthcare system for the one who is affected by it.

V. Other countries bear the cost associated with the production of illicit drugs/changes in other government policies.

Economists study the cost-benefit analysis of any evaluation. In this case, they study how drug abuse in the people of the country is directly affecting the economic environment of the country. They will design the framework in which they will look upon the different budgets which are spent on the healthcare systems, justice, policing, business growth, and overall efficiency of labor productivity. In the United States, about 48% of employees are involved in drug abuse whether it is cigarettes, alcohol, cocaine, or any other substance. One out of every four young masses is affected by drug use. According to the Anti-Narcotics force of the country, about 40% of males and 75 % of females in the major cities of Pakistan are involved in the use of the drug. It costs the annual budget of the country too high. As we have scarce resources, allocating more money for health will directly affect the inclusive growth of the country by not allocating the money for the mega projects in the country. The benefits portion of the analysis is driven through a process that if the government spends one dollar per student through training, seminar, and anti-drug drives, it may save many dollars in the future that one student will need for better health if affected by drugs.

The problem of drug abuse and its effects on economic growth and businesses have given a rise to Health economics, behavioral economics, and organizational economics in its field. The health economist prepares the policy guidelines on what to be done in the terms of a few areas which include law and order, budgeting for the health system, constitutional implementation, checks and balances, and overall monetary evaluations of the economy. The best possible solutions Economists derive is that the Human- Capital Expenditure should be increased for more awareness of the issue and the leadership building of the youth.
The healthcare system must be revised, and policy should be made for the better budgeting of all the sections of the system under the Equity rule (fair distribution of wealth and resources) of economics. The prices of the substances should be increased, and customs duty should be imposed on the imports of

these materials so that overall consumption must be decreased as per the law of demand.

Globalization Has Turned On The West
Mushahid Hussain
1013-BH-ECON-18

After World War II, the world experienced enormous growth driven by rampant consumerism and the growth of faith in free enterprise. The fall of communism further strengthened faith in the western led system. In recent years, there has been a backlash against globalization from the western world. The onus for the resentment goes to the emergence of other markets of the world. The emergence of other markets of the world started threatening the western interest in globalization. This can be further endorsed by keeping in view the rising share of Japan in the car market, the dominance of the Chinese market, and a wave of terrorism in the west. Apart from this, the response from the west to these has been pathetic in the form of a rise in trade tariffs, stopping China's emergence through nationalism, and following strict immigrant policies to stop terrorism on western soil. In short, globalization is eating the bear of the west from every side, and it will keep eating until it damages the malign double-standard approach of the west towards the world. Therefore, there is no denying the fact that globalization has turned on the west and it will keep gravitating the negative response from the west until the west gets back into the game. From a historical perspective, people have been trading goods for almost as they have been around. The first stone in the building of globalization was set in the form of the trade of luxury goods from China in the first century. In addition, the journey was further pushed by the age of discovery that started in the 15th century; Columbus is credited for this stone in the building of civilization. The main triggering force in this journey is Adam Smith who gave direction to the West to exploit the nature of globalization as they were superior in the category at that time. The second and third waves of globalization followed the later part after World War II. Now in the 21st century, it is damaging the father, west, of globalization. The rise of Japan in recent times is an amazing example of this phenomenon. Japan needs no introduction in the car industry as it is the main supplier of cars in the world market. According to the pundit on this topic, the reason behind Japan's rise in the car market is its fuel efficiency and affordability. In 2005, the Economist reported that the market share of Nissan and Honda in the car market had more than the big three companies of America and it beat the other western companies in the market. The Economist's stated fact is no doubt proving that the bear of globalization is no more giving profit to the west and now it is playing in the hands of Asian countries. Cutting the long story short, the west has learned nothing from Ibn Khaldun that it is over, and their threegenerational period is over. The rule time is now for Asian countries.

In addition, in 2010 Barack Obama, former president of America, greeted his Chinese counterpart with a bow at a summit in Washington. That bow was discussed from different angles. One part of the angle was the hint towards the decline of the west. Similarly, Arvind Subramanian wrote in the book "Eclipse" about the gesture and hinted towards the decline of the western world. On the bases of that, he also predicted that China would dominate the world market. To deter this part in the globalized world, the west triggered a trade war with China and brought Trumpism in the west to stop China's economy to dominate the world. Apart from this, the influx of terrorism on the soil of the west under the mantra of a globalized world has pushed its policies to go hard on immigration. There is no denying the fact that after 9/11 the west has opted for strong immigration policies and started a war on terror. To some extent, the New York Times reports that the onus goes to the weak security system of the west otherwise terrorism could not have happened in the west. On the other side, the west showed resentment in the form of a strict immigrant policy. This is very sad to say that globalization's turn against the west has the west a real butcher of the blood of the competitor. In a nutshell, the west needs to be patient because globalization got boomed on their soil now the time is to show some grace when it is no more in the favor of their interests.

ICT adoption and Innovation; A way forward
Aneela Nawaz
1024-BH-ECON-18

Today technology is emerging and taking us towards a more advanced technological world. Information and communication technology (ICT) is often considered the 8th wonder of the world

as it has proved to be one of the most wonderful inventions of human beings. It is defined as the technologies that with the help of the internet and other modes assist in communication, information transference, information processing, analysis, and storage. The adoption of ICT is improving globally due t its influence on many aspects of societal and economic activities. Thus, at the micro level ICT has an impact on the daily life of individuals but at the macro level, this kind of tool aims to participate in the development of a more sustained future.

Unlike any other time in history, the turn of the 21st century indicated an unmatched jump in the step of technology adoption. Today, 95 percent of the global population lives in areas covered by mobile cellular networks and mobile broadband networks also have reached 84 percent of the world population. The affordability of information and communication technologies is increasing immensely. At the end of 2015, the average price of mobile broadband approximated 5.5 percent of GNI per capita globally. In the last decade, utilization of the benefits of ICTs and innovation to jump the phases of economic development has been the main development discussion. It is hard to debate the truth that innovations and technology have been crucial drivers of human development.

Innovation and technology have been the center of human progress thus influencing the lives of people globally through the betterment of health and education facilities, clean water and sanitation, efficiency, and accessibility. The mortality rate has reduced by almost 50 percent during the years 1960-1990 due to innovations in science and technology. ICT and innovation can have a direct influence on the standard of living by having a positive influence on human development. The relationship between ICT and human development is positive, the increase in ICT uplifts the GDP of a country and improves the conditions of people by creating employment opportunities for them. By improving agriculture conditions, enhancing foreign direct investment (FDI), and driving international trade, the internet can successfully play a positive role by contributing to GDP growth.

12 pillars are used by the World Economic Forum to measure the global competitiveness of countries. Among these 12 pillars, the adoption of ICT is the weakest growth pillar in Asian countries even though it has ubiquitous benefits. In the report on Global Competitiveness rank of South Korea is 91 with a score of 3 in ICT adoption while India has the weakest rank 117th with a score of 28. South Korea is also ranked second in Asia due to investment in innovation, it has also improved the quality of universities and performance in its scientific publications. These gaps indicate the unequal distribution of technology resources throughout the world. The unequal distribution of technology must be addressed to create a just world.

Despite the immense benefits of Innovation and ICT adoption, more than half of the population is not yet making use of the internet in the developing world. If developing countries want to improve the standard of living of people, they should focus on the adoption of technology and innovation. As adoption of technology and innovation can help countries in moving forward through improved education across geographical and physical restrictions, enhanced research and development for productivity, better healthcare facilities, and increased value chain interaction across several sectors of the economy.

Informal Economy And Green Taxes;
A Pain And A Panacea
Zoha Khan
1039-BH-ECON-18

Environmental degradation has become a serious dilemma for countries worldwide. To achieve the Sustainable Development Goals (SDGs) linked with the environment; the identification of environmental degradation sources is important. Researchers are focusing on the relationship between environmental degradation and economic growth; even environmental economics is a grasping field for researchers. The Shadow economy or informal sector is an important factor in environmental degradation as the firms are not held accountable to follow environmental regulations and they evade the pollution emission index. Shadow economy or illegal sector of economy comprises not only illegal activities but also includes unregistered activities in any economy. The foremost reason that has caused a rise in the shadow economy is the lack of accountability, regulations, and higher taxes. The average shadow economy for Zimbabwe is calculated to be 60.6 percent which is the highest globally; for Austria, the shadow economy comprises 8.9 percent of the total GDP which is the lowest globally. Economists have been arguing about the negative and positive

impacts the shadow economy has; some say that it contributes to the labor sector by providing job opportunities whereas others do believe that they reduce the formal sector which causes economic disruption. Developing countries are combating many evils such as inflation, poverty, unemployment, and current account deficit. Environmental degradation and the informal economy are closely related as air pollution is rising day by day due to harmful emissions from industries and vehicles. Leather tanning, brick making, urban transportation, and metalworking are also some of the activities that come under the informal economy and cause pollution in the environment. Astonishingly, not much research is done for analyzing the shadow economy's relation with pollution. This article not only emphasizes the impact the shadow economy has on pollution but also explains the role environmental taxes can play to curb this effect. The cost of the business in the informal sector is increased by more firm regulations. To achieve the required objectives, the factors that determine the negligence of institutions to control corruption must be monitored. The impact of control of corruption on recorded pollution indicates that after the informal sector is controlled air pollution is reduced. Regulations leave a negative impact on pollution but the actual level of pollution reduction is not clear. This disruption is due to the deregulation effect on the shadow economy. As the name informal sector indicates that it comprises practices that are not under government regulations and restrictions which is why this effect takes a toll on the economy. A larger amount of environmental pollution is due to the deregulation impact the shadow economy has. Strict environmental regulation can curtail the impact of pollution. The strict regulation of environmental conditions has a positive impact on informal sector regulations. To promote reduced emissions and industrial upgrading environmental taxes were introduced in 1990 in Finland. This law was imposed on all enterprises and institutions responsible for discharging pollutants directly into the environment. On the other hand, developed countries have been implementing green taxes since the 1980s on firms emitting pollutants. The Shadow economy is directly affected by an increase in environmental taxes; with an increase in environmental taxes, the activities done by the informal sector are taxed which ultimately causes the percentage of the informal economy to reduce. Eventually, this leads to a reduction in carbon-dioxide emissions. Control of corruption plays a vital role in regulating the environment; a considerable increase has been seen in environmental literature over time. Institutional quality affects the quality of the environment in both direct and indirect manners. The article studies the shadow economy as a prime indicator of institutional quality. Good governance leads to increased confidence in the system and reduced shadow economy, which enhances air quality.

However, strict environmental policies like higher taxes on pollution emissions can cause an increase in the informal sector and air pollution. The government should promote renewable energy and regulate energy consumption and economic growth to reduce air pollution. Researchers and policymakers should adopt such techniques so that the shadow economy is curbed; as pollution and the informal economy are considered to be evil global problems. Such policies should be formulated so that they encourage firms in the informal sector to move toward the formal sector. Strict environmental regulations are to be implemented to conserve the environment. Environment-friendly cars should be made common. One way is that government lowers the tax on environmentally friendly cars and increases the tax on pollution-emitting vehicles. Taxes should be reduced on companies that have introduced clean technologies. This will work as an incentive for companies and firms to move towards this initiative. Already existing regulatory bodies are needed to be strengthened to reduce the impact the informal economy has on the environment. Harmony should be developed among neighboring countries by institutions to curtail the informal economy and pollution.

Similar legacies but different outcomes for South Korea and Pakistan.

Hijab Fatima
LUMS

South Korea and Pakistan have faced similar histories of exploitation, conflict, and resource scarcity. Both countries were exploited under imperialism, with their culture, language, and history being threatened. Both have also faced civil wars and conflicts with neighboring states that pose a threat to their territorial integrity. South Korea's experiences can be traced along with imperialism in South Asia, while Pakistan faces similar issues with imperial rule and independence, civil war, and continuous conflicts with the neighboring state of India. India and North Korea are similar nature of the threat to the territorial integrity of Pakistan and South Korea respectively.

South Korea is often put forward as a case study for comparison and understanding of the contemporary differences between India/Pakistan and South Korea's economic and political situation. South Korea after the division lost most of its natural resources and means of power reserves and factories to North Korea, with few light industries and agricultural land at its disposal. To

counter the threat to national sovereignty and survive as a newly independent nation-state, South Korea adopted inclusive and extractive economic and political institutions. Social Institutions of South Korea such as education, culture, and ideology were employed by the political leaders to amalgamate and shape all individual interests into national interests.

The division of the sub-continent into Pakistan and India as British colonial rule ended in 1947, held a similar or maybe worse fate for Pakistan. Pakistan inherited the geographical regions with limited resources and reserves as most of the industrial areas and canal system were given to India, not only that the rivers were divided in a way that made Pakistan dependent on Indian rivers until the Indus Water Treaty was signed in 1960. The territorial integrity of Pakistan was easily vulnerable due to the geographic placement of East Pakistan (Now Bangladesh) which had a closed border with India and had no territorial geographic relation with West Pakistan leading to its declaration as an independent state in the 1971 war.

With enemy states on the border and scarce resources, South Korea and Pakistan both struggled initially to build basic power reserves and stability as autonomous states. Both states had to experience civil wars which resulted in heavy exhaustion of resources and uncertainty. Along with shared histories, Pakistan, and South Korea, have experienced a fair share of Martial Rule and dictatorship. However, the outcomes were rather similar yet very different. The threat to political freedom and expression was experienced by both South Korea and Pakistan likewise however the economic progress during Martial Law was rather different.

Park Chung Hee, the president of South Korea, focused on "economic self-sufficiency and prosperity" and invested heavily in ICT Information and Communication Technology) and education. This led to a period of rapid economic growth and prosperity in South Korea, with the country growing at a rate of 7%. The people of South Korea also rallied around this goal in the name of nationalism and anticommunism to address the threat from North Korea, viewing economic growth as a means for survival and independence.

Contrary to South Korea, Pakistan as a country failed to mobilize under a common nationalist agenda aimed at economic growth. Pakistan instead invested heavily in the military and ended up being subject to US manipulation as a result of US aid. Not only the US aid forced the Pak-US alliance in its containment policy against the Soviet Union but also crippled its local industry to a great extent as they became dependent on US aid heavily for basic commodities such as wheat and eatables. Pakistan's economy suffered due to its involvement in the Cold War and reliance on US aid, compounded by government policies prioritizing military and defense spending over other sectors. This, along with heavy imports, foreign loans, and aid dependency, weakened Pakistan's competitiveness in the international market. The country's slow GDP growth is linked to these factors, as well as the fallout from the Afghan war and the influx of refugees, which worsened terrorism and deepened cultural divisions. Pakistan's continued provision of airbases to the US also kept it active in the Cold War.

Pakistan's economy suffered due to government policies prioritizing military and defense spending and relying on US aid, leading to decreased competitiveness in the international market. On the other hand, South Korea's government invested in education, ICT, heavy production, and tertiary industries, boosting economic growth and employment through export-oriented industrialization and import substitution. This approach helped establish South Korea as a major contender in the international market, leading to the formation of international conglomerates like Samsung, Hyundai, LG, and SK Holdings. Pakistan requires a stable political system that is directed towards export-based subsidies and aims at eradicating social differences to form a strong national identity. Internal stabilization and expansionary fiscal policies are crucial to sustaining a healthy economic environment.

The Pension Bomb: Clock is Ticking

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The economy of Pakistan has been facing a new form of accumulated debt, which is increasing with every passing day, it’s the pension bill. According to the quarterly financial report of the State Bank of Pakistan, the total pension expenditure as a part of tax revenue reached 18.7 percent in the financial year 2020. Specifically, the pension expenditure at the federal level has increased by 18 percent in the country during the financial year 2011 to 2021. Provincial pension spending has also witnessed a parallel rise. During the last five years, the estimated civil pensions expenditure was reported to be 63.2% of the total pension expenditure, this included both; federal and

provincial pensions. On another hand, the military pensions expenditure constituted about 36.8% of the consolidated expenditure in the last five years.

It is feared that, in case, the present pension system is not transformed, in the upcoming years it will not only create financial hitches but also increase social unrest among civil and public servants. The situation in Punjab and Sindh is already starting to be bad. Many public sector departments and higher education institutes have started to feel the early shocks, in terms of financial constraints, due to this pension bill. For example, Pakistan Railways is one of the first departments (federal level), which is currently facing the problem. The pensioners are often not able to get their monthly pensions on time. As per the reports, Pakistan Railways' annual pension bill was around 34 billion rupees in the year 2020. The government has already made a pay and pension commission, which is working on the contributory pension scheme, which is different from the current pension scheme. The estimate for next year's pension bill is around 470 billion rupees for employees of the federal government. The salary bill for employees is presently around 700 billion rupees, and in case of any increase in the next budget, both the pension and salary bills will increase.

It is pertinent to mention that in Pakistan most of the departments are relying on the federal and provincial government funds for salaries, specifically pensions. There are very few institutes, which have made their pension funds. Most of the federal and provincial departments are relying on the AGPR (Accountant General of Pakistan Revenues) in this regard, on the federal and provincial levels respectively. The overall mechanism of pay and pension needs to be revised. There are certain issues, which need to be addressed, regardless of the political point scoring.

In this regard, the first and foremost thing is to give additional benefits during the pay and encourage people for long contractual jobs. The scale revision is very much due. The pay and pension commission constituted by the Government of Pakistan must finalize its recommendations and the Government of Pakistan must implement those reforms at the earliest. In this regard, proper legislation must be done to carry out the procedure quickly.

Another important thing is to revamp the existing pension mechanism. For instance, the contributory pension mechanism must replace the existing pension mechanism. The contributory pension plan is a pension plan where employers keep and do not pay a certain amount of a worker's earnings instead, they set it aside, such as 5%, in an investment account. This amount is received by the workers on retirement. This can also include any other savings the workers have saved during their time as an employee. These contributions are paid into an individual account for eachmember. These savings are regarded as contributions because the firm uses them to make investments such as the investment in the stock market, then the returns from these investments are credited to the worker's account. When the workers retire, they are provided with retirement benefits. These benefits are often provided via the purchase of an annuity. This helps in providing a regular income. The contribution plans have become popular in the world in recent years and are now an integral part of the various job structures.

On the other hand, another viable option is to decrease the pensionable service to a specific period, after which any yearly increment will not be made part of the pension percentage. In this regard recently the provincial governments of KPK and Sindh have decided to maximize the pensionable service by up to 25 years. Any government employee will only be able to get pension benefits of 25 years only, regardless of the service years. In this regard, the retirement age should be 55 years.

These pension reforms are the need of the hour. It should be done on a priority basis to avoid social unrest among civil servants. The scales should be revised on a priority basis so that civil and public sector employees can get additional benefits. The political point scoring in economic matters has already affected the economy of Pakistan. The government of Pakistan must consult the other parties in the parliament, to do the required legislation. As it is said, unfortunately, the clock is ticking, and the hours are going by. The past increases and the future recede. Possibilities decreasing, and regrets are mounting.

INSTITUTE OF INDUSTRIAL BIOTECHNOLOGY



TIMELINE

January, 2022

The first small-molecule drug targeting RNA, beneficial for spinal muscular atrophy patients, has been developed.

February, 2022

Researchers at Stanford University, studying optogenetics to elucidate underlying neuropsychiatric disease said that light-activated genetic therapy for blindness treatment is ready to enter into clinical trials.

March, 2022

The world's first lab-cultured, cell-based meat has been approved by the Singaporean Food Agency. Meat, grown in the bioreactors, made into chicken nuggets and offered to a chosen few diners in Singapore.

April, 2022

Scientists have found the very first important link between fecal microbial transplants (FMTs) and immune checkpoint inhibitors. The study revealed that FMTs boost the anti cancer efficacy of immune check point inhibitors.

May, 2022

A new study has revealed how any past exposure to SARS-CoV2 can be found with the help of a new diagnostic test built on sequencing long-lived SARS-CoV2 specific memory T cells.

June, 2022

Next-generation antibodies called 'Super-antibodies' are being designed by companies with belief that they may control COVID-19 variants, related coronaviruses, and aid in deterrence against future pandemics.

July, 2022

Research on CRISPR identified new genotoxicity concerns called chromothripsis, an extremely damaging form of genomic rearrangement after CRISPR introduces dsDNA breaks which can cause serious genetic issues.

August, 2022

Chinese companies and IT giants are venturing into field of drug designing and development. Insilico Medicine, a Hong Kong-based company has thus raised $255 million to start clinical trials.

September, 2022

The revolutionary authorization for Amgen's drug Lumakras (the world's first KRAS inhibitor) against Ras-oncoproteins offers a new last line of defense for lung cancer patients.

October, 2022

A new alternative way to fight against the COVID-19 pandemic is by Nanotechnology, where all of the focus is on antiviral nanomaterials as pandemic countermeasures.

November, 2022

Companies are using regulatory T cells, to suppress immune responses, offer tolerance to transplant recipients, or control the inflammation driving autoimmune disorders —locally and for the long term.

December, 2022

The First CRISPR-edited food, genetically edited tomatoes containing high amounts of GABA to support lower blood pressure and promote relaxation, has entered the market in Japan's open market.

Fruit Waste- A Potential Substrate for 'Baker's Yeast' Production at Industrial Scale

Nimra Riaz
0215-MPHIL-MB-20

Saccharomyces cerevisiae commonly called baker's yeast is a global key ingredient in the baking and winemaking industry. According to research data obtained, only in the European yeast industry alone, around 1 million tons of yeast is produced annually and 30% of it is exported globally. Just from 2013 to 2018, the annual yeast growth rate in the global market was found to be 8.8%. *S. cerevisiae* feeds on sugars (carbon sources) during the fermentation process and produces industrially important products. Carbon source is certainly the main cost factor in baker's yeast production. Therefore, searching for new carbon sources to produce cost-effective brewer's yeast is desirable. The use of fruit waste, as a carbon source, in baker's yeast production is a feasible, economical, and environment-friendly way.

The valorization of baker's yeast is done through the fermentation process. It involves the action of enzymes to create chemical changes in complex organic molecules producing yeast as an end product. The word 'fermentation' is derived from the Latin verb '*fervere*' means 'to boil', thus describing the appearance of the yeast on extracts of fruit or malted grain. Historically fermentation was defined as the chemical conversion of organic products by the action of microbial enzymes on them. And industrially fermentation is described as the production of a specified product by yeast, bacteria, and/or fungi.

Fermentation has been used to preserve and modify foods since prehistoric times. Fruit fermentation is a natural phenomenon, so much so that it was attributed to 'Dionysos', the 'deity of fruit fermentation', by the Greeks. Beer, fermented milk drinks, and soy sauce were among the early food items produced through the fermentation process.

S. cerevisiae is the most researched eukaryotic organism and is a valuable study model organism in most aspects of eukaryotic basic research. *S. cerevisiae* is useful for most biotechnological applications due to its unique biological features, such as its fermentative ability, which is followed by the production of CO_2 & alcohol, and its resilience to extreme conditions of pH and osmotic pressure. It is considered safe for human consumption in the food and beverage industries. In a wide range of bread production, *S. cerevisiae* is a leavening agent in many baked goods, because it can produce ethanol and carbon dioxide by utilizing the sugars present in the dough. It helps increase bread dough volume, brings changes in the product structure, and provides flavor and taste to the bread. In the beverage industry, it helps produce fermented and distilled beverages such as rum, wine, vodka, brandy cider, beer, sake, and whisky. Both active and instant dry yeast can be produced from *S. cerevisiae*.

The substrate used for yeast biomass should be efficient and cheap, containing good percentages of carbon such as waste produced during starch production from cassava, and food waste. Nowadays, efforts are being made to substitute the carbon source of a semi-synthetic fermentation medium with fruit extract. Food is lost and wasted at an alarmingly high rate every year all around the world. Food waste is described as "food losses in quality and quantity occurring at the production, postharvest, and processing phases of the supply chain." The most common types of fruit byproducts, such as seed, pulp, peel, and pomace, are wasted in the form of leftovers, accounting for 10–35 % of the raw mass. Now studies have shown that these leftovers can be reused as substrate in industrial fermentation.

During my research study at the Institute of Industrial Biotechnology, Government College University, Lahore, Pakistan in the year 2021-2022, I found out that orange peel is the best substrate for the maximum biomass production of baker's yeast at the lab scale and pilot scale. The study findings show the possibility of applying these results at an industrial scale to produce cost-effective, economical, and environment-friendly baker's yeast.

Other than carbon sources, optimal growing conditions like time, temperature, and pH also have a significant impact on fermentative power and stress

tolerance. As a result, better fermenting yeast may be developed, which not only be beneficial in producing consumption products even at freezing conditions but also be free of any source of contamination to provide a better customer experience. Furthermore, the characterization of novel yeast strains with efficient capacities in terms of both fermentation and stress tolerance is critical. Thus, hereby I conclude that baker's yeast can be produced sustainably by using fruit leftovers on an industrial scale.

Next Generation Sequencing-A Revolution in Today's Biology

Syed Hussain Abbas Kazmi
0031-BH-BIO-T-20

To sequence the complete human genome, the data of several DNA fragments must be put together, which is not only timeconsuming but an expensive task. Previously, genome sequencing approaches relied on enzymatic (Sanger sequencing) or chemical (Maxam-Gilbert Method) procedures. Advanced technology for DNA sequencing is Next Generation Sequencing (NGS). It is a powerful technology offering speed, scalability, and ultrahigh data. It helps determine nucleotide order in the genome or particular DNA/RNA regions. In 1977, Sanger sequencing was adopted as the core technology of "First Generation" in laboratory and commercial sequencing applications.

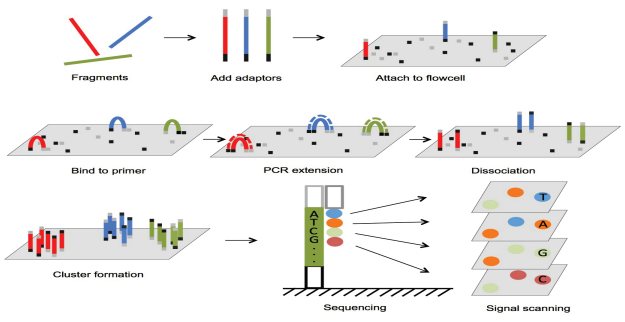
The human genome project took the help of Sanger technology, where for the first time human genome was sequenced. The project ended in 2003 and it took almost 13 years to complete. However, in comparison, with the help of NGS Technology human genome was sequenced in over 5 months for approximately $1.5 million in 2008. NGS is much faster than old Sanger sequencing as it can sequence the whole human genome in only one
day.

The basic working principle of the NGS is based on four steps;
I) In the first step, with the help of enzymes or by centrifugation, DNA is cut into fragments,
ii) In the next step, certain adapter oligonucleotides are bound to the DNA fragments to create a "DNA library",
iii) DNA fragments are then bound to a solid reaction medium and are replicated. The same DNA cluster will be generated where the actual sequence will take place. Because it is divided into clusters, many sequence operations can be performed simultaneously in a very short time.
iv) The generated data is saved in the form of a DNA chip and bioinformatically evaluated. The phrase "next generation" a next step in the evolution of DNA sequencing technology and implies that new technologies will be named the "next-next" generation in the future, so the terms second generation, third generation, and so on are preferred.

In second-generation Illumina sequencing, adapter-ligated, single-stranded sequences are annealed to a glass plate precoated with oligonucleotides corresponding to the adapters after DNA fragmentation, adapter ligation, and gel purification.

These oligos act as templates for DNA capture and primers for further amplification of DNA. Amplification happens on the slide through a mechanism known as 'bridge amplification,' where each single stranded molecule binds with oligo primers present on both ends of the slide. Following rounds of PCR, little clusters of amplified molecules are formed, which work as template clones for future sequencing using chain terminators, like standard Sanger sequencing. Different from the Sanger approach, however, Illumina employs fluorescently labeled reversible terminators, such that each single base inclusion on each molecule momentarily stops the synthesis.

To identify which nucleotide is integrated into each DNA clonal cluster, a high resolution digital picture is employed. Following imaging, the terminator is chemically reversed, which allows the template molecule to be expanded again in the following cycle of sequencing. As a result, the sequencing reaction completes on the vast majority of molecules. 454 Sequencing (Roche Diagnostics) uses pyrosequencing which is based on the detection of pyrophosphate, produced during nucleotide incorporation. In Ion Torrent sequencing, as part of the normal chemical reactions of nucleotide incorporation, a hydrogen ion is released. An ion sensitive semiconductor detects this ion as a minor change in pH.



Illumina Sequencing Platform– Biomarker Technologies

In the case of third-generation sequencing, very long fragments of DNA, up to 30–50 kb, or longer are sequenced with the help of PacBio sequencing, also known as SMRT (Single Molecule Real Time) sequencing. The SMRT approach requires the attachment of a designed DNA polymerase to the bottom of a well with bound DNA to be sequenced. Fourth Generation Sequencing has long DNA molecules that can pass through tiny diameter "holes". Variation in current is measured here as each nucleotide passes by a coupled detector. More than a hundred kb of DNA could theoretically pass through the nanopore, and with numerous channels, tens to hundreds of GB of sequence data may be obtained at a minimal cost. One of the examples includes OXFORD Nanopore Technology (minION).

Next Generation Sequencing has many applications such as; i) It can be used to investigate specific sections of the genome, ii) De novo mutations, or variants that appear for the first time in an individual, are the most unusual type of mutations. Characterizing these mutations with the help of NGS provides an estimate of the baseline of the human mutation rate and its relationship to parental age, iii) The comparison of a person's cancer genome to the normal genome (taken from unaffected tissue DNA) through NGS offers a thorough description of the somatic alterations that occur throughout the transformation from normal to malignant cells, iv) NGS is useful in areas like metagenomics, pathogen biology, genome diversity, genomic epidemiology, and epigenetics. Targeted sequencing and unbiased investigation of clinical samples for drug resistance profiling, microbiome studies, pathogen detection & identification, strain typing, microbial metabolism, and comparative ribosomal RNA phylogenetic studies are examples of these.

Although NGS is time effective and cheaper than first-generation sequencing techniques, it's still too expensive for many labs. Inaccurate sequences of homopolymer regions on certain NGS platforms and short sequence read lengths can lead to sequence errors. Greater personal expertise is needed to comprehensivelyanalyze and interpret sequencing data. In conclusion, Today's complicated genomics problems need a degree of information that conventional DNA sequencing technology cannot provide. NGS has filled that void and has revolutionized the biological sciences, enabling labs to undertake a wide range of applications and research biological systems at a seemingly impossible complexity. The change that Next Generation Sequencing technologies are anticipated to bring about is similar to the revolution brought about by the advent of PCR in the 1980s. This technique will undoubtedly represent a breakthrough in breast cancer fundamental and translational research; nonetheless, several hurdles are still laying ahead.

ISO (International Organization for Standardization): A Food Microbiologist's Best Friend

Anam Nadeem
0603-BH-MB-19

Food Microbiology is the study of microorganisms involved in food production and contamination. It encompasses both beneficial and harmful microorganisms, with a focus on their effects on food products. Examples of beneficial microorganisms include those used in food fermentation for products like cheese, beer, yogurt, and bread. On the other hand, microorganisms can also cause food contamination and transmit diseases. The main microbes studied in food microbiology are bacteria, yeast, and fungi. They can cause changes to food's appearance, flavor, and odor if they contaminate it. The physical and nutritional characteristics of food do not determine the fate of microorganisms but there are many other factors as well which are classified as intrinsic and extrinsic like; temperature, pH, and Water Activity. All methods involved in the preservation of food are based upon at least one of the following reasons: i) preventing microbial contamination, ii) inhibiting microbial metabolism, and iii) destroying microbes in food. Food safety and security are the major focus of Food Microbiology. Many disease-causing agents are transmitted through food such as viruses and bacteria. Microbial toxins are major food contaminants. Different criteria have been set in food microbiology to determine the quality of food according to different sorts of food items. Ready-to-eat foods can be consumed by the consumer without the need of being cooked. There are three major microbiological limits to determine their quality; ACC (Aerobic Colony Count), hygiene indicator microorganisms, and specific foodborne pathogens. If the results of food testing are found satisfactory then food is classified to be of good quality. If food testing shows borderline results, then the food is classified as not satisfactory. If the results are unsatisfactory then the food is classified to be detrimental to health. Food quality assurance (QA) not only includes food-related equipment, waste treatmentmachines, culture media, and its reagents but it also includes associated staff members. . QA department is concerned with education, hygiene measures, and their performance related to food quality. Food quality comprises its safety, shelflife,

and its consistency. The microbiological quality of food is both controlled and determined by food industries and regulatory bodies. Criteria for the microbiological quality of food are defined by ICMST (International Commission on Microbiological Specifications of Food). ISO is the International Organization for Standardization. It is a worldwide federation and has many standards for food safety and quality; i) ISO-835 is a standard of laboratory glassware such as graduated Pipettes, ii) ISO-11133 protocol includes the microbiology of food, also the microbiology of animal feed, and water as well, iii) ISO-7218 includes all the apparatuses and equipment used in the laboratory. All protective cabinets and working stations are



included in this standard. Different types of balances, gravimetric dilutions, autoclaves, and various media preparations are included in it, iv) ISO-19036 is associated with the estimation of measurement uncertainty for quantitative determinations. Its major applications include the analysis of products that are for human consumption. It involves taking samples from the environment, and the environment where food production and food handling are carried out. It also includes taking samples at different stages of primary production, v) ISO-6888, which is the international standard for 'Horizontal methods for the enumeration of coagulase-positive *Staphylococcus*. This organism has great implications for hygiene. It produces a toxin named enterotoxin which is the major cause of food poisoning. It is found in cheese, milk, and in food products that undergo handling with bare hands. Food manufacturers take great precautions regarding this bacterium as it resides on women's skin and noses.

Food safety is a crucial aspect that affects international trade and is governed by different criteria in different countries. The increasing demand for safe food, along with rising food safety standards and new emerging food diseases, has complexly impacted the relationship between food safety and trade. Controlling and managing food safety is based on the principles of Hazards Analysis Critical Control Point (HACCP). Molecular markers are being used in human illness surveillance, they help in the detection of outbreaks and socio-epidemiology. Both private and public sectors play a role in controlling food safety and preventing illnesses caused by food and microorganisms. Developments in molecular techniques have improved communication between consumers, scientists, and risk managers to handle food safety problems. The efforts to handle food safety problems are expected to improve with increased mutual efforts.

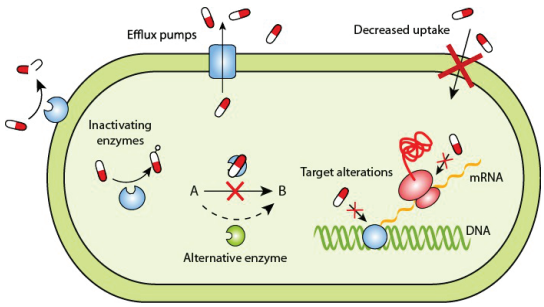
Can bioinformatics be the solution to curb Antibiotic resistance?
Sania Sahreen
Associate Editor

Since ancient times, antibiotics have been used to treat infectious diseases. However, the only problem was not knowing the clear distinction between therapeutic and toxic dosages. It means that antibiotic resistance was present since its very first use but it became a known fact in the late 20th century. In 1924, Alexander Fleming discovered the antibiotic penicillin which laid the foundation of the modern era of antibiotics. Many bacterial infections have been treated with the use of antibiotics like cephalosporins, glycopeptides, macrolides, quinolones, sulphonamides, aminoglycosides, tetracycline, and penicillins but the emergence of resistant bacterial strains has hampered the use of the antibiotics.

Antibiotic resistance has been listed as a major health threat according to the World Economic Forum Global Risks report. UN also said in its report that by 2050 deaths due to antibiotics resistance will be around 10 million each year and economic damage will be as catastrophic as the 2008-2009 global financial crisis. In 2017, around 223900 cases of *Clostridioides difficile* occurred which resulted in 12800 people's death. In 2019, the U.S. centers for disease, control, and prevention reported around 2.8 million cases of multiresistant *tuberculosis* and 35000 deaths due to the infection. All this proves the severity and lethality of antibiotic-resistant cases and resultant deaths.

There are two molecular bases of antibiotic resistance

in bacteria; gene mutation and horizontal gene transfer (acquiring genetic material from the environment). Several mechanisms aid bacteria in acquiring resistance such as; changes in the bacterial target site, low drug uptake, drug exclusion due to the activation of efflux pumps, changes in metabolic pathways, target enzyme alternations, changes in drug entry and efflux mechanism, etc.



Bioinformatics is an interdisciplinary field involving various computational techniques such as structure and sequence alignment, and analysis of biological data like protein samples, cell populations, and genetic sequences to predict and discover new biology. Recently, due to the increasing amount of data generated every day, bioinformatics has gained momentum in fields such as transcriptomics, molecular biology, proteomics, and genomics. Bioinformatics tools and techniques are very much in use in pathogen identification, controlling bacterial resistance, predicting a patient's response to treatment, and identifying markers for early disease diagnosis and treatment.

Software very often employed in bioinformatics are; Autodock Vina for ligandprotein docking, Chimera to prepare and view 3D docked complex, Swiss model-online software for homology modeling, and Avogadro-for ligand energy minimization, etc. There are various bioinformatics-based strategies through which antibiotic resistance can be prevented, for instance; whole genome sequencing strategy, Insilco identification with the help of associated plasmid, metagenomics, antibiotics databases use, and use of machine learning tools, etc. to curb antibiotics-associated resistance.

Among antibiotic resistance, the emergence of multi-drug resistance bacteria (MDR) is a serious threat to immunocompromised Intensive care unit (ICU) patients in hospitals. That's why hospitals emphasize effective outbreak management practices in clinical facilities. Understanding the way pathogen transmission occurs through different genotyping methods is important to managing outbreaks. An accessible and more affordable way of genotyping is whole genome sequencing (WGS) of the pathogen which provided important insights into pathogen transmission, bacterial lineages, and outbreak pattern analysis in hospitals. Newly developed sequencing analysis tools and techniques have reduced the costs of whole genome sequencing, and have increased the outputs. Genome sequencing provides a great option for drug design and bio-molecular modeling for antibiotic resistance.

A similar platform for protein modeling and drug designing is available through Deoxyribonucleic acid (DNA) sequencing. To use protein three-dimensional structures in speeding up the drug discovery process, astounding progress has been made in protein expression, nuclear magnetic resonance (NMR), genome sequencing, and high-throughput crystallography.

With every day, antibiotics resistance is increasing and plasmid-mediated horizontal gene transfer has played an important role in it. To understand the plasmid's role in transmitting antibiotic resistance in bacteria, it is crucial to first assess various plasmid characteristics and their association with their bacterial hosts. An important technique in this regard is strain genotyping and plasmid molecular identification which gives important information about antibiotic-resistant gene transfer through plasmid and their further dissemination between bacterial clones.

Research study reveals that in *S. Virchow* and *S. Poona*, resistant genes were found on IncX1 and TrfA/IncHI2/IncHI2A type plasmids, these two plasmids were first time described in these serovars. Genomic analysis tools helped in the full mapping of resistance plasmids in all *Salmonella* strains. The study showed potential in identifying plasmids associated with resistance phenotypes in wholegenome sequences. Based on this information, rapid, and fast multi-drug resistant tracking tools in *Salmonella* populations can be developed with the help of whole genome sequencing.

Antibiotic resistance mainly focuses on a few pathogens based on laboratory results which limits the spectrum and doesn't include all antibiotic-resistant genes. Metagenomics involved studying the structure and function of an organism's entire nucleotide sequences in a bulk sample. Metagenomics, which uses short read next-generation sequencing data, can quantify transmissible resistance genes data, even in thousands, in a single sample without any predetermined genes. Henceforth, it can be used to gather information about pathogens,

bacterial specie presence, virulence genes, etc. Metagenomics-generated data can also be reanalyzed in case a new gene is identified. This ability of metagenomics makes it a potential future tool for antibiotic resistance surveillance in bacteria.

Databases for antibiotic resistance such as the Comprehensive Antibiotic Resistance Database (CARD; https://card.mcmaster.ca) provide protein and DNA reference sequences, bioinformatics tools, and detection models for the determination of antimicrobial resistance. Within controlled vocabulary, it provides quality reference data and molecular sequences. CARD use was expanded in 2017, due to 500 new antibiotic resistance detection models curation, new classification paradigm development, ontological structure revision, analysis of expansion tools, and reference sequences curation. With the help of Resistomes & Variants, the newly available module, in silico resistance variants of 82 pathogens and more than 100 000 genomes can be analyzed and statistically summarized. If these resistance variants are added to CARD, a summary of predicted resistance with the help of information already present in CARD can be generated. Other than that, trends in antibiotics resistance can be identified and previously unknown and novel resistance variants can be determined. To prevent bacterial resistance to antibiotics, it is very important to understand bacterial existence, activities, and functions on a molecular basis. In recent times, bioinformatics is doing a great job in gene sequencing, followed by gene alignment, gene proteomics study, and drug discovery. Complete knowledge of antibiotic resistance in bacteria is the prerequisite to unleashing the full potential of bioinformatics. Hopefully, in near future, bioinformatics tools will help achieve an improved therapeutic drug/outcome to treat bacterial infections without the fear of antibiotic resistance in bacteria.

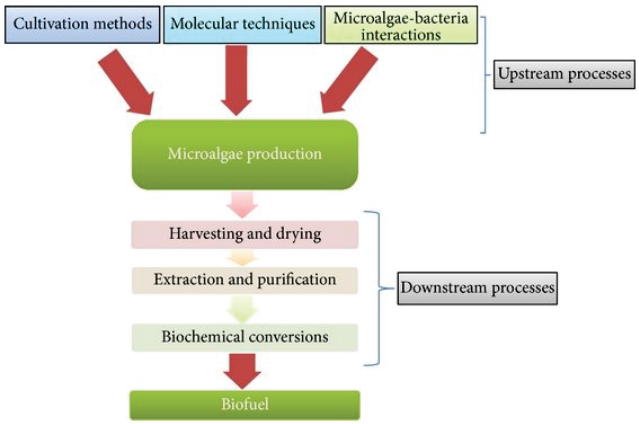
Microalgae: A Cheap Alternative Feedstock for Fuel Production
Atif Iqbal
0605-BH-MB-18

With the everyday increase usage of fossil fuels to meet the energy demands of the world population and industries, the world energy crisis has become a problem that needs an immediate and everlasting solution. Therefore, the world is now moving towards renewable energy resources to produce sustainable energy. Recently, International Energy Agency (IEA) acknowledged that energy produced by waste substances and combustible resources has a much higher potential to produce energy than any other renewable resources. Now the focus on bioenergy (biomass-derived renewable energy) is more than ever before.

Biomass is simply put a biological material produced upon photosynthesis. Microalgae, a photosynthetic microorganism, is catching the attention of researchers to produce biofuel (bioenergy). The two most common types of biofuel are biodiesel and ethanol. A recent study reported that the use of biofuel is increasing mainly in the transport industry. Biodiesel has much more advantages than fossil fuel because it is non-toxic, easily biodegradable, and has low emissions of greenhouse gases. Microalgae-based biofuel is placed in 3rd generation of biofuel as an alternative source for fossil fuels. The first generation of biofuel is produced from crop plants i.e., sugar cane, corn, vegetable oil, etc. Its main drawback is deforestation, water scarcity, etc. 2nd generation of biofuel is produced from nonedible oils and lignocellulose biomass. This type of generation could not get success due to a lack of efficient technologies. 3rd generation biofuel requires a limited amount of food crops, arable land, and water. Microalgae depend upon waste stream nutrients i.e., power plant carbon emission and wastewater. Depending upon the abovementioned drawback of 1st and 2nd generation, microalgae biofuel is now considered the best replacement for fossil fuels.

Microalgae-based biofuel production is carried on by two major phases i.e., upstream, and downstream processes. In the upstream process, the main focus is on the cultivation of microalgae biomass in maximum quantity, on the other hand, the downstream process focuses on the production of biofuel and harvesting technologies. Microalgae biomass production is performed by various types of culture systems i.e., batch, semi-batch, and continuous systems. Production rate and growth rate depend upon multiple factors such as abiotic, biotic, and operational factors. Microalgae are cultivated by different types of methods such as phototrophic, heterotrophic, mixotrophic, and photoheterotrophic. Among all these methods, only the phototrophic-based cultivation method is suitable to get large production of biomass.

Microalgae are photosynthetic organisms that have very high photosynthetic efficiency and growth rate when compared to higher plants. Microalgae are cultivated by two methods i.e., i) open bonds and ii) enclosed photobioreactor. The open bonds method is



one of the oldest, cheapest, and most simple method for the large-scale production of microalgae. Approximately 98% of commercial microalgae is produced by this system. Different types of open bond systems are classified depending on their shape, size, and material. Genetic engineering in microalgae is an easy approach because of its unicellular formation. The major reason for using genetic engineering is that it helps in getting increased biomass and biodiesel production from microalgae. After obtaining huge biomass of microalgae, cells are separated from the water and are further proceeded in a downstream process. It is estimated that the separation process requires 20-30% of the total cost. This drying and harvesting process is the major energy-consuming process in the production of biofuel from microalgae. Therefore, it is need of the time to study ways to reduce the cost of harvesting and drying otherwise the total cost of biofuel production will ultimately increase.

There are different methods used for the extraction of oil from the microalgal biomass i.e., CO_2 extraction, osmotic shock, solvent extraction, enzymatic extraction, etc. The main factors to be considered while selecting a process for oil extraction other than quality, are the cost, efficiency, and toxicity of the chosen process. Enzymatic extraction is commercially available, but some efforts are needed to decrease the price of the process. By working on the areas responsible for the limited production of biofuel, it is expected that the world energy crisis problem can be solved with this microalgae-based biofuel production approach.

Nanotechnology: A Blessing in Disguise for Cancer Diagnosis and Treatment
Laiba Iqbal
0009-BH-E-BT-19

Nanotechnology is a new advancement in the field of science and biology and has revolutionized the treatment mechanism of some medical diseases. In nano technology based treatment methods, nanometre size materials which are extremely small, even smaller than our cells are used. All of it means that this technology has made it possible to treat certain diseases at a very tiny level. In cancer treatment, these Nanoparticles are helpful in not only finding the location of cancerous cells but also killing it accurately compared to other methods of cancer treatments.

Imaging tests like X-rays, Magnetic resonance Imaging, and CT scans are used for cancer diagnosis. The problem with these tests is that we won't know about any lesion until it becomes big enough to be visualized. When a lesion has attained a reasonable size, by that time cancer cells have already begun to replicate in different parts of the body. Moreover, through these tests, we don't know the nature of the cancerous mass; whether it is benign or malignant. However, with the use of nanotechnology, even minute and minimal changes in cells can be detected.

Nanotechnology has made tumors easily visible in routine-based imaging tests. Antibody coated nanoparticles adhere to cancerous cells and send signals once they have located cancerous cells in the body. The best example is Iron oxide nanoparticles which stick to cancerous cells and send a signal which can be seen on MRI scans.

As far as conventional methods for cancer diagnosis and treatment are concerned, there is no treatment or cure for cancer other than surgery. Surgery is performed only when cancer has not spread and is localized to certain body parts and can be removed by mere surgery. The limitation to this method is that one may even lose their organ and there is always a chance of recurrence. Radio and chemotherapies are other approaches to cancer treatment. In radiotherapy, the variation in specific frequency and intensity of radiation causes the killing of cancerous cells. On the other hand, chemotherapy offers the same approach with the only difference of it is being administered through toxic drugs. Disadvantage associated with this method is that these therapies also kill healthy cells along with cancerous cells. Aside from this, these therapies are only successful if the cancer is not in an advanced stage.

In nanotechnology, nanoparticles are specifically made to absorb radiations of different wavelengths. So when

such nanoparticles come in contact with cancerous cells, they will burn these cancerous cells upon getting irradiated by specific wavelength radiation. The specific targeting of cancerous cells and later their killing is achieved through nanotechnology. Some tools of nanotechnology are helpful in diagnosis while others find their role in cancer therapy. Quantum dots, Nanoshells, and gold nanoparticles are used for diagnostic purposes while Liposomes, nanotubes, polymeric micelles, etc. are used in therapies.

Quantum dots are very tiny particles that tend to light up when energized by UV light. The crystals are filled with latex beads. They emit color when light strikes them. Variable sizes of quantum dots can be added in a single bead thus it would stimulate the release of a specific spectrum of different colors having variable light intensities. This would act as a bar code for the spectra. Nanoshells are extremely small and gold coated. We can create beads that have the capability of absorbing specific wavelengths of light. There are many types of it but the most important ones are those that can penetrate tissues and absorb infrared (IR) light. These are used for imaging and also for the selective destruction of cells when they are stimulated by a light that is coming from near the IR region. Antibodies tend to attach to these shells thus would help in the recognition of cancer cells. The mechanism of action is that these Nano shells generate heat which ends up killing the cancerous cells and the healthy cells are left unharmed.

Different sorts of nanoparticles are being designed in laboratories that can act as efficient drug delivery vectors such as Dendrimers. The branching shape of these dendrimers gives them a large surface area where therapeutic agents bind. One dendrimer cannot only recognize cancerous cells, but it can kill and also identify the signals corresponding to the death of cells. Nanotubes can be used in the identification of changes that occur in DNA due to cancer. With the help of these tubes, we can locate the position of these alterations. The areas linked with cancer are first tagged with heavy molecules. The Nano tube's tip can trace the shape of DNA. A sort of topographical map is made by the translation of the information by computer. The tagged heavy molecules are efficient in knowing the whereabouts of the mutated regions.

The main goal of cancer nanotechnology is to create safe and effective methods dealing with diagnostics and therapeutics to fight against cancer. Drugs that are encapsulated using nanoparticles are the specific target of tumor cells and can prove beneficial and less toxic to healthy cells. The tools of nanotechnology namely liposomes, dendrimers, cantilevers, gold nanoparticles, nanotubes, etc. have roles in diagnostic and treatment-related areas. A lot of targeting molecule platforms have been emerging for their usage in the engineering of Nanocarriers. Examples include antibodies, peptides, aptamers, etc. To rule out possible errors associated with nanotechnology, preliminary tests should be performed on an animal. It would depict the risks associated with the use of nanoparticles. Aside from this, attention should be paid to environmental and potential effects on the health of those workers dealing with the manufacturing of these nanoparticles. There is an urgent need for safety guidelines by the government for the use and development of such particles.

In the coming years, applications relevant to nanotechnology will become common practice in the field of medicine and hopefully, patients suffering from cancer would have to undergo a milder form of treatment.

Pharmacogenomics; A New Approach in Cancer Treatment
M. Ahsan
0039-BH-BIO-T-19

Cancer is a leading cause of death across the globe. According to the report published by WHO, nearly 10 million people died in 2020 due to cancer which means that one out of every six deaths was caused by cancer. Cancer is a disease where the body's cells grow unrestrained and may spread to other parts of the body (metastasis). The most commonly known cancer forms are lung, breast, prostate, rectum, and colon cancers.

There has been some major advancement in cancer treatment due to recent revolutions in medical science. One such approach in cancer treatment is its early diagnosis which leads to several respective treatments depending upon the type or stage of cancer. These treatments could be chemotherapy, radiotherapy, surgery, or biological therapies. A common obstacle in cancer treatment is the variable extent of targeting drugs' efficacy or toxicity for different individuals. These variations can be lethal and life-threatening for the person receiving the medication. This is due to genetic factors which play an important role in determining drug toxicity or efficacy, keeping in mind the physiological factors of a person.

To overcome this problem a technique called pharmacogenetics has been introduced. Pharmacogenetics is the frontier of genetics in which



inheritance-generated differences in drug deposition and effects are studied on different individuals. The main goal of this study is the development of optimal drug dosage and drug therapy for cancer patients. As conventional cancer therapies express severe forms of systematic toxicity and unpredictable potency for each individual due to genetic polymorphism present in the genes of different individuals. As a result of this, in most treatments, the outcome of chemotherapy is quite unpredictable.

Cancer pharmacogenomics has been a center of attention because it has the potential to individualize cancer therapy in terms of maximizing drug efficacy and minimizing toxicity. It should be noted that there is a clear difference between the pharmacogenomics of cancer compared to other diseases. For example, in the case of cancer, both the somatic, as well as germline genomes of the patient, are involved. The germline genome is responsible for the inherited genetic difference between individuals while the somatic genome causes the inconsistent response to therapy due to somatic mutation.

Gene polymorphism is responsible for the accurate prediction of outcomes in cancer pharmacogenomics which can be utilized for cancer treatment. Several chemotherapy agents, known as candidate genes, are used in cancer studies. A few of them are Thiopurines, Fluorouracil (5-FU), and Irinotecan.

Thiopurines are generally a part of the drug family which includes 6-mercaptopurine (6-MTP). 6-MTP is a daily constituent of childhood maintenance therapy for the acute form of lymphoblastic leukemia. There happen to be three main metabolic pathways followed by 6-MTP, these pathways start with the activation process of 6-MTP into 6-TGN with the help of HGPRT (hypoxanthine-guanine phosphoribosyl transferase). The next step follows the inactivation process of 6-MTP (via oxidation process) into thiouric acid. This process is catalyzed by the xanthine oxidase enzyme. The last step is the inactivation of 6-MTP into red blood cells and the liver via TMPT (thiopurine methyltransferase). Several studies have suggested that the deficiency of TMPT in a patient causes a high risk of hematopoietic toxicity and is treated with conventionally used doses of thiopurines.

Fluorouracil (5-FU) is a uracil analog commonly used in the treatment of solid tumors such as breast or colorectal cancer. Its basic requirement is its activation of 5-fluoro-2- deoxyuridine monophosphate (5-FdUMP). DPD (dihydroxy pyrimidine dehydrogenase) is responsible for the inactivation of almost 85% of fluorouracil inside the liver. 5-FdUMP normally causes the inhibition of tumor cell replication by inhibiting TS (thymidylate synthase) production. Several gene polymorphisms have been observed in DPD that can cause a reduction in its activity. Generally, 3-5% of individuals are considered to be heterozygous mutagenic gene carriers that cause the inactivation of DPD. Only 0.1% of patients carry a homozygous mutation that inactivates DPD. Irinotecan is known to be an inhibitor of topoisomerase-I and is used in the treatment of several solid tumors. It is also required to be activated into active metabolite SN-38 via carboxylesterase. The toxicity that has been associated with this gene is leucopenia and diarrhea which are caused by a sudden increment in the level of SN-38 UDPglucuronosyltransferase 1A1, normally found in the liver and is responsible for SN-38 by the process of glucuronidation. This process is usually done to produce a more inactive and polar form of SN-38 glucuronide which is later removed in urine and bile. In chemotherapy, the lower rate of glucuronidation is known to be an important factor in toxicity prediction. The reduced transcription rate caused by an abnormality in the dinucleotide repeat sequence leads to a lower concentration of glucuronidation. The study has shown that the UGT1A1*28 allele is responsible for the increment in the number of active metabolite SN-38 which develops the chances of side effects including leukopenia and diarrhea during the irinotecan therapy. The current approach in pharmacogenomics faces many limitations, for example, the candidate gene approach is unable to provide an accurate and reliable prediction for drug response in tumors and normal levels of toxicity in tissues. This is because of the lack of understanding associated with all the participation factors. The future pharmacogenomics approach should mainly focus on specimen collection for both somatic and germline tumor DNA. Specimen collection should be done during early and later trials of

clinical data along with respective efficacy and toxicity data as it will provide more acceptable validation and discovery of pharmacogenomic associations. In the next step, the genes undergoing validation and replication must be treated with clinical implementation. A large amount of retrospective case-control replication and validation studies following phase-II clinical trials driven by biomarkers should allow a rapid and efficient method of translation from head to toe.

It is hoped that with enough progress in cancer pharmacogenomics, more effective, safer, and reliable cancer treatment methods will be developed for cancer patients.

Rise of Biocomputing and the Emergence of Databases in "Contemporary Biotechnology"
Noor A Geen
0021-BH (E)-BIO-T-19

The study of the human genome is of the continual topic of interest for scientists in general and molecular biologists in particular. To cope with the widespread scientific ongoing discoveries, and everyday findings, multiple databases have been developed to meet the expected research demands. These databases are crucial to managing extensive sample sequences, complex gene expression as well as posttranscriptional regulation sequence studies. Databases could be the setting-off point for developing complex disease study models, particularly of those in which the causative agent of the disease is not easily identifiable and are relying on model studies to find a cure. Such databases make tasks far simpler, quicker, and easier to work with to get speedy results in the current era of the hustling world!

Why and when did bioinformatics come into being? The foundations of bioinformatics were laid in the early 1960s. Bioinformatics is an interdisciplinary field that develops methods and software tools for understanding biological data in the fields of genetics and genomics, in particular when the data sets are large and complex. The primary breakthrough as per Berend Snel: was "The major transformation in the field is to be able to sequence genomes". Having a genome or not having one is pivotal to revolutionary science developments, for example in making personalized medicine and directed breeding. At the same time, an even more important reason is the recent life science data surge such as genotyping, transcriptomics, or proteomics that came into being due to the availability of genomics. Such new techniques may aid scientists to assemble new data, and analyzing it in detail.

The basic data analysis principle does not change and all of the data present today is closely related to the techniques that follow up on each other and are amenable to be replaced by new ones in this terrain. The exchange of data and the speed of its progress is a key features in scientific knowledge growth and advancement. In scientific research fields, databases are essential as they permit easy access to the data storage as well as allow continuous integration of more "data" to this stored data, thus keeping up with the ever evolving science. Data from fields like metabolomics, proteomics, and genomics can be collected and browsed smartly for its intended use from specific databases-designed software.

The Genome Online Database (GOLD) is one such database that is sought for being a comprehensive resource of genomics-relevant information in addition to metagenome projects. Since it offers access to a great variety of biological materials, it has a pivotal role in the bioinformatics branch. Ever-expanding amount of genomic data needs a systematic methodology for its storage, handling, and organization. That is why, this specialized database can harbor particular information concerning differences intaxonomy, functions, and order of discovery.

Scientific research projects especially those involving experiment designing, require ample information in



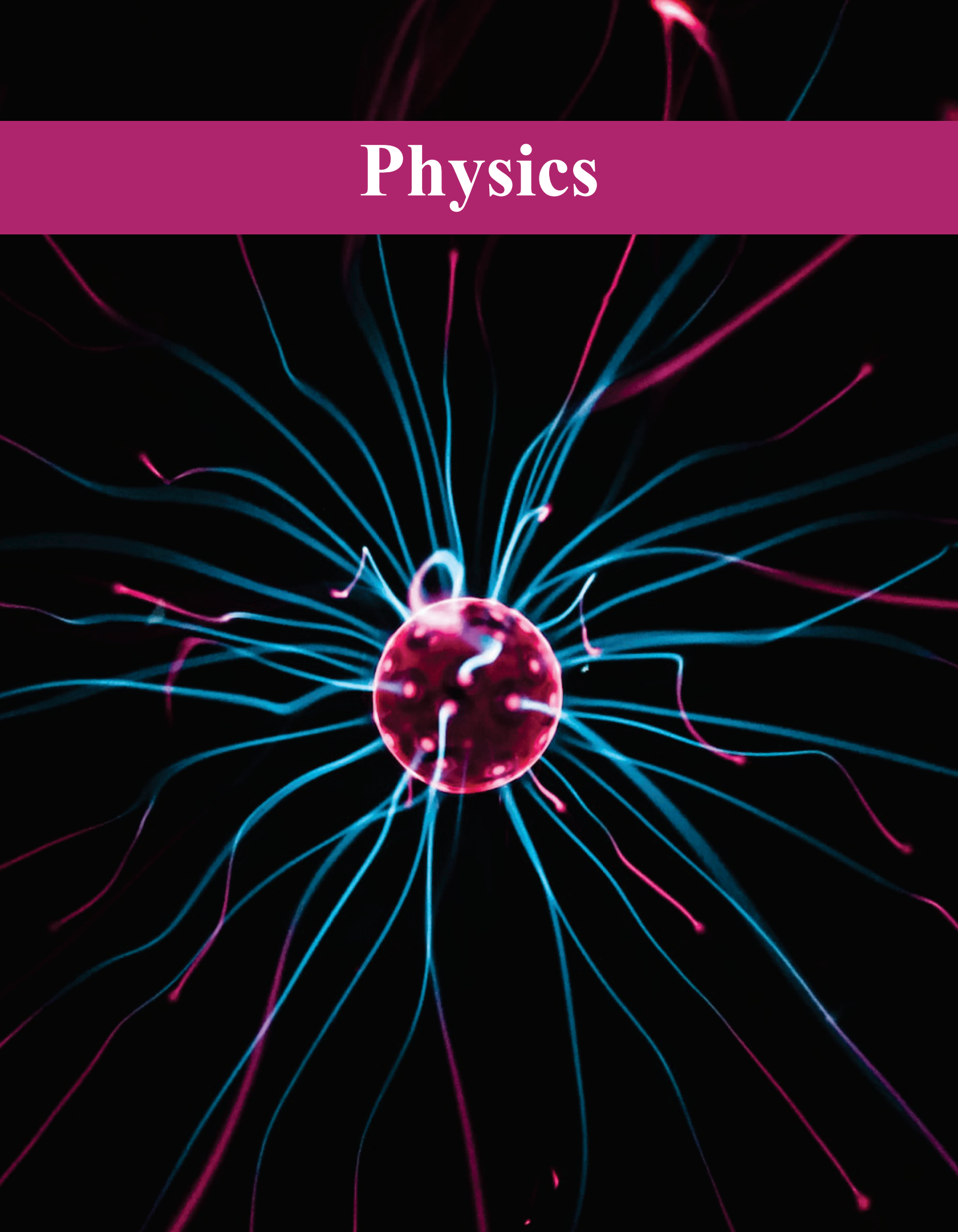
their initial stages. The ever-growing number of published articles related to biomedicine coupled with easier internet accessibility has added to the weight of databases significantly. Even more so, access to databases and scientific sites is free and open to all users. PubMed for instance, an eminent site that covers subjects pertinent to genomes and genetic disease, provides sufficient literature to the researcher to its heart's content. . However since biomedical literature needs broader coverage, it includes a wide range of interdisciplinary subjects as well. PubMed bibliographic therefore is a very potent and wellrun biomedical site resource lately.

Biotechnology is "unimaginable" without the inclusion of the word "Genetics". There are huge accounts of databases on the subject of genetics. Roughly 3,000 databases are available strictly designed for genomics data. GenBank, NCBI, and Genome Data Viewer GDV to name a few, have been developed for molecular diagnostics. Progression in scientific research, very often, revolves around biomedicine to constantly participate in supporting the patient(s), so an insight into the human genome and understanding its components is of utmost significance. In the same vein, numerous databases support the connection built up between scientific studies and results around the world thereby maintaining universal consistency. Bioinformatics is a novel discipline that enables biologists to utilize complex software programs to retrieve, sort, predict, analyze, and store DNA /protein sequence data. Bioinformatics is employed commercially by pharmaceutical companies to meet the requirements for a large-scale industrial run. It is highly probable in the near future for biomedicine laboratories to mandate hiring an expert bioinformatician to aid in complex data analysis.

The databases commonly reported in genetics and molecular biology are; gene sequences as well as protein databases. There are two types of gene sequencing databases: 1- primary databases containing results of experiments into the database directly without any extra information and 2- secondary databases that conglomerate primary databases findings along with other data. When analysis of uncommon genetically derived diseases is the aim, General Databases are looked into which allows information about any particular illness or disease gene to be easily identified.

In conclusion, it is important to state that in the current era wherein science and technology have taken utmost value, there is a constant need for technology in almost all areas of biological sciences. Therefore, biotechnology seems to explode and take the lead. Gene therapy, drug development, molecular medicine, crop development, evolutionary studies, bioweapon, forensic analysis and many more are thriving on the foundation of Bioinformatics. Which brings us to the question what is Bioinformatics' future? Keeping in view the modern-day growing need for bioinformatics in biomedicine research, and biological sciences in general, it is quite practical to believe for future biology and biotechnology to hugely rely on bioinformatics. In the not-too distant future, the potential for using genes themselves to treat a disease may become a daily reality!

Physics



TIMELINE

January, 2022

The Aharonov-Bohm effect was conclusively established by a series of electron interference experiments. It was detected by coherent field-emission electron beams.

February, 2022

An object hidden below ground had been located using quantum technology. It is indeed a long-awaited milestone with profound implications for industry, human knowledge, and national security.

March , 2022

Studies have claimed that the pressure wave resulting from asteroids or comets striking the surface of Mercury at tens of kilometers per second could transform that graphite into diamond.

April, 2022

Recent observations looking at decades of data from Neptune during its summer season revealed that instead of getting warmer, the planet had actually cooled about 8℃.

May, 2022

Using data from the Chandra X-ray Observatory, scientists found that the black hole at the center of the Perseus galaxy cluster is producing pressure waves that ripple into space.

June, 2022

New research suggests that Jupiter may have gotten so large by gobbling up smaller planets during its formation. Researchers theorize that while Jupter was still growing, it absorbed other planetary materials around it.

July, 2022

Physicists have reported the observation of a tetraneutron, a subatomic particle consisting of just four neutrons.

August, 2022

The James Webb Space Telescope peered through dust and gas to reveal star formation in a rare wheel-shaped galaxy called as Cartwheel that formed in a long-ago galactic crash.

September, 2022

The first image of Mars from the James Webb telescope consists of two images taken at two infrared wavelengths observed from a point almost 1.5 kilometers from Earth at the L2 Lagrange point.

October, 2022

In a successful attempt to alter the orbit of an asteroid for the first time in history, NASA crashed a spacecraft into the asteroid Dimorphos.

November, 2022

A system of nine quantum bits has been used to simulate a state known as a holographic wormhole. It is a concept that features in attempts to reconcile quantum mechanics with the general theory of relativity.

December, 2022

Boron arsenide (BAs) is a recently synthesized semiconductor that has a thermal conductivity of 1,300 $W\ m^{-1}\ K^{-1}$ at ambient conditions, second only to diamond.

The Cat is Dead AND Alive!
Rida Jabbar
Visiting Faculty Member (Physics)

You might have heard about Schrödinger's Cat. If not, here I have a little piece of information for you! First of all, make it clear that I'm not talking about his tamed kitty! This cat is a thought experiment of a well-known scientist Erwin Schrödinger, who made many contributions toward quantum mechanics – the world of weirdness! The experiment explains the odd nature of quantum superposition. So, let's get the ball rolling! Consider you have placed a cat inside a box along with a vial of poisonous gas and some radioactive particles. The box is sealed, and you can't guess what is happening inside it. All that exists inside is PROBABILITIES! Besides, the vial can break if the decay of a radioactive particle occurs, and consequently, the cat will die. As per Quantum Mechanics, radioactive decay itself is a probabilistic phenomenon that can occur in any instance. Thus, we can't exactly say if a certain particle will decay or not in a given interval of time. Now imagine that after some time, an unobserved particle will be in a superposition of decayed and undecayed states. But since the little kitty's life depends on the state of the particle, does it mean that the poor soul is dead and alive at the same time? Well, that's something weird, isn't it?

In reality, we will never see the cat simultaneously alive and dead! As soon as we open the box, the cat will only be in one of the two states. However, the experiment's practicalities don't allow for this. Hence, you will remain uncertain about the situation until you peek inside the box. Despite its limitations, Schrödinger's cat offers us a sense of the strangeness of superposition, and while such a test would be impossible with a sophisticated organism like a cat. Planned experiments with microscopic animals such as a tardigrade could bring an aspect of Schrödinger's cat experiment closer to reality

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All About James Webb Space Telescope (JWST)
Fatima Shahid
Lahore College for Women University

NASA's James Webb Space Telescope is an infrared space observatory that was sent off on Christmas Day, 2021 Sun-Earth, a European Ariane 5 rocket. Its total cost stood at $10 billion. James Webb is one of the biggest and most remarkable space science telescopes, providing the clearest view and operating at a level that has exceeded expectations. The James Webb Space Telescope is a milestone in the field of astronomy and ushers in a new era of scientific discovery. **It is considered one of the most significant scientific inventions of the year 2022**.

It required 30 days for the JWST to travel almost 1,000,000 miles (1.5 million kilometers) from Earth: a Lagrange point (L2) — a gravitationally stable area in space. Lagrange point (L2) is a spot in space that lies 1.5 kilometers directly behind the Earth as viewed from the Sun. The telescope showed up at L2, the subsequent Sun-Earth Lagrange point on January 24, 2022. It has been a famous spot for a few other space telescopes, including the Planck Space Observatory and Herschel Space Telescope.

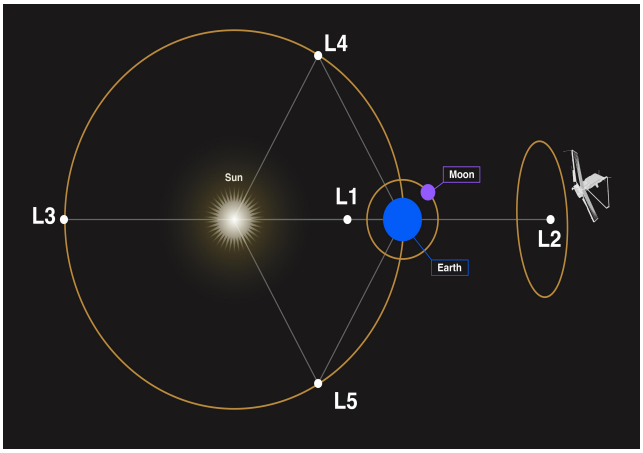
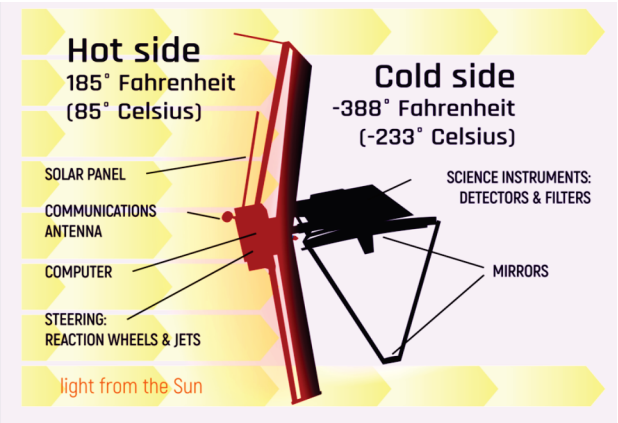


Figure 1. Lagrange points in space

The location of JWST at L2 makes it easy for scientists to communicate with the telescope. The location of James Webb relative to the Earth will always be the same, hence, astronomers have continuous communication with the telescope's three large antennas on the ground. These antennas are located in Spain, California, and Australia. JWST will uplink command sequences and downlink data two times per day during routine operations.

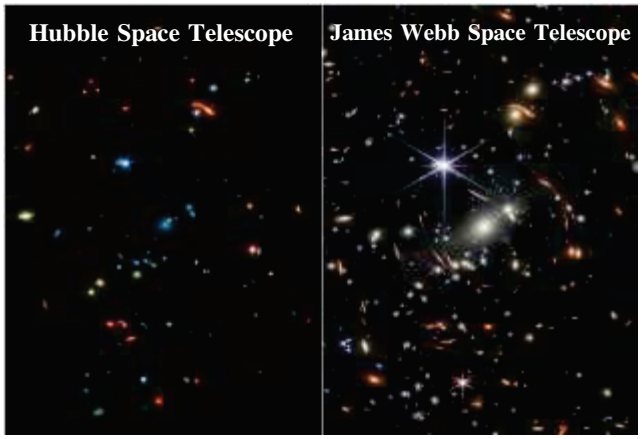
JWST's sun shield was deployed on December 31, 2021, and its five layers were opened on January 3-4, 2022. The auxiliary mirror was installed on January 5, 2022. The sun shield serves as a barrier between the sensitive mirrors and instruments and the Sun/Earth/Moon, allowing the telescope to operate at about 225 degrees below zero Celsius. The sun shield provides around 1 million units of protection from light and heat, and the telescope is positioned at the second Lagrange point (L2).

On January 8, 2022, NASA announced the successful deployment of the main mirror on the James Webb Space Telescope (JWST). The next step was to



Two sides of James Webb Space Telescope

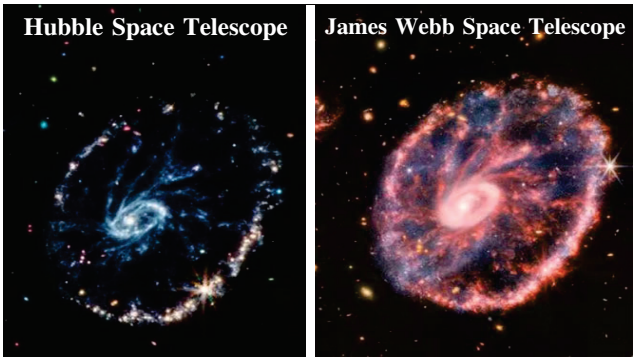
assemble the 18 individual beryllium mirrors that make up the main mirror, which was estimated to take up to 120 days after launch. On July 12, 2022, NASA released the first image taken by JWST, which showed the universe in high resolution and was considered the deepest image of the universe ever captured, with a marked difference from previous images taken by the Hubble Space Telescope.



Comparison between the image resolution captured by Hubble Space Telescope and JWST

The most recent picture with remarkable details taken by JWST is the Cartwheel Galaxy that has been revealed on August 23, 2022, by the JWST's Near Infrared Camera and Mid Infrared Instrument. This Cartwheel named galaxy is about 500 million light years away from us. As shown in the figure, the background galaxies are not visible in the Hubble Space telescope. All the hidden stars are visible in the image taken by JWST.

Image comparison captured by Hubble Space Telescope and JWST



The James Webb Space Telescope (JWST) is a collaboration between NASA, the Canadian Space Agency, and the European Space Agency. It was designed to observe infrared light from the most distant stars and galaxies in the universe, providing new insights into their formation. The JWST orbits the Sun, allowing it to have a constant and uninterrupted view of the cosmos. The project required the participation of over 300 colleges and organizations across 14 countries but was delayed due to design issues, political reluctance, and project management problems. In 2011, funding for the JWST was in jeopardy but was later saved. The launch was postponed several times, including in March 2018 due to technical issues, and was finally launched in March 2021 after a recommendation by an independent review board.

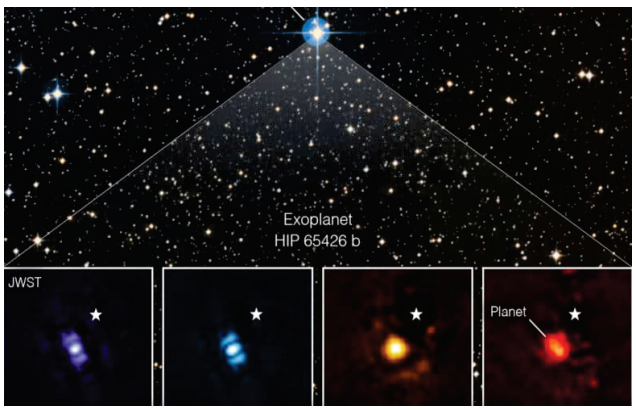
The James Webb Space Telescope (JWST) was impacted by the COVID-19 pandemic in 2020, leading to a new launch date announcement by NASA in July 2020, set for October 31, 2021. Despite the challenges faced by the JWST team, further delays occurred. However, the JWST is now at its observing position L2, which is approximately 1 million miles away from Earth and is considered the largest and most powerful space telescope ever launched into space.



Molten Iron could fall as rain where day turns to night on some ultra-hot gas giants.

James Webb Space Telescope data continues to stun the scientists. In an early science result, astronomers used the observatory to detect carbon dioxide in the atmosphere of an exoplanet (planets beyond the solar system). It's the first time scientists have confirmed that particular chemical's presence. The deep-space observatory observed an exoplanet with evidence of silicate-rich clouds.

It has been only a few months since the James Webb Space Telescope is set into operation and it is continuously making remarkable discoveries in outer space. The first image ever captured by the deepspace telescope is a photo of a strange alien world. From the Earth, the planet is approximately 385 light years away. This planet appears to be a splotch beside the store HIP 65426. JWST captured the exoplanet by utilizing its Mid-Infrared Instrument (MIRI) and Near-Infrared Camera (NIRCam).



HIP 65426 b enormous gas planet photographed by James Webb Space Telescope

The sensitive instruments of James Webb revealed miraculous detail in a gas cloud called Dorados 30. This cloud was primarily nicknamed **Tarantula** due to its spider-like appearance. However, this Tarantula Nebula is discovered in the Large Magellan Cloud which is almost 161,000 light-years. This is the brightest star-forming region in our neighborhood apart from our very own Milky Way.

The Day Synths Took Over The World – Physics Of Synthesizers

Arjumand Shahzaib
BS-Physics

With the onset of the 20th century, music has been revolutionized due to the abundant use of electronic music. Modern music consists of lots of electronic sounds and instruments, one such example is the use of Synthesizers and Electronic Drums or Zen-Drum. These instruments are entirely electronic in their origin and what is more fascinating is that the music incorporated with such sounds is getting very popular among people. The most recent example is the Coke Studio season 14, which has used electronic sounds throughout the season. Most of the songs are more defined by the Electronic Music Genre. This is a huge shift for Pakistani Coke Studio from more cultural music towards more amalgamated forms of electronic music with other musical genres. Even hardcore Hindustani classical music is being merged with such electronic sounds to give the audience a brand-new experience. Most of the sounds that we can hear in today's music are generally electronically generated. I think we can rightfully expect an imminent replacement of the original instruments with this new breed of instruments, but that is a topic for some other article. Presently this article is more inclined toward the "Physics of Synthesizers"

Synthesizers, better known by the short name, Synths, are being amply used in music scores of movies, live music performances, playback songs, etc. There is not a single slot left inside the music industry where these are not being made use of. It is a new breed of musical instrument that is altogether different from its predecessors due to its unique electronic sound. Some earlier Synthesizers are:

- The Dynamophone, patented by Thaddeus Cahill in 1897.
- The Theremin, patented by Leon Theremin in 1928.
- The RCA Electronic Music Synthesizer Mark I, released in 1956.

But the real thing is the involvement of physics in Synthesizers. These consisted of electronic oscillators to produce sound. The most appropriate method is to first get a grasp of the Analog Synthesizers. So, what are analog synthesizers? An Analog Synthesizer makes use of analog circuits and signals to generate electronic sounds. Earlier Analog Synthesizers were made using Vacuum Tubes, which were dominantly in use at that time. Over time, technology went through an evolution and, only in a short period, vacuum tubes became a thing of the past. These were effectively replaced with more sophisticated stuff such as Op-Amp, Ics, and Potentiometers to generate a wide range of sound spectrum electronically. The basic building blocks of an Analog Synthesizer are VCO (Voltage Controlled Oscillator), VCF (Voltage Controlled Filter), and VCA (Voltage Controlled Amplifier). The "Minimoog" is the most popular

example of an Analog Synthesizer.

A *Voltage Controlled Oscillator* has an "oscillation frequency" that is controlled by a voltage input. This frequency is variable and it generally ranges for a wide range of orchestral sounds and much more. These are effectively used in Synths to generate desired waveforms whose pitch can be modified by a voltage determined by a Musical Keyboard.

$$f_v = \alpha \, exp(V/V_0)$$



Minimoog Instrument

This fundamental frequency given in the above equation is controlled by voltage for a particular range, with the only condition that this range should lie within the octave range of orchestral sounds; any frequency higher than this will result in a non-musical sound, hence of no interest to the music producers. The in the above equation is a constant and defines the tuning of a particular instrument as each instrument is tuned according to a different standard, that is why the constant varies for different instruments. V_0 in the given equation establishes the scale, usually for a 12-note chromatic scale $\mathbf{V_0=\{(ln2)\ \}\ V.}$ This module is responsible for the sound production process. It is the first step toward shaping electronic noise into a somewhat musical sound spectrum.

A *Voltage Controlled Filter* is essential in the sense that it shapes the tones you get out of the Synthesizer and it is responsible for each characteristic sound of a Synth. Again, the voltage controls the filter according to the aboveequation. It is obvious from the word filter that it will let some frequencies pass and filter the rest of the unwanted frequencies. Usually, a lowpass filter of *12-dB/octave* frequency cutoff is very useful for musical purposes. In this filter, the frequencies above the cut-off frequency are blocked. There are other filters such as bandpass, high-pass, and notch-pass as well. The filter is the part that is indulged in controlling the flow of frequencies.

A *Voltage Controlled Amplifier* is an amplifier whose output can be controlled with the help of a voltage signal. The voltage gain is proportional to the control voltage. The VCA is effective in maintaining the spectral shape of the note, which was not possible in the past. For example, VCA is very good at achieving the "Tremolo" effect which is used in many instruments. Also, VCA combined with Envelope Shaping gives rise to ADSR (Attack, Decay, Sustain, Release), which

brings emotion and aesthetic natural feeling to the notes played. The third module brings this bandwidth of musical sounds to life, by introducing the manual effects of a note electronically.

With the birth of Synthesizers, multiple artists, bands, and music directors have made immense use of this technology to give a new flavor to their music. Nowadays EDM (Electronic Dance Music) is becoming more and more popular than the classical variants of music. Many bands employ Synths as a dominant part of their discography. Some of these bands and artists are Daft Punk, Stereo Lab, Project Pitchfork, Paradise Lost, The Scientists of Modern Music, Suleman-Salim Merchant of Merchant Records, Amit Trivedi, Zedd, etc. These days a legion of artists is emerging that are employing electronic forms of music to present their art. In no time electronic music will have taken over the movie scoring department as well, which is evident from the complex sound design of the multiple award-winning Sci-Fi movie "Annihilation" 2018.

Muon G-2 (Evidence of New Physics)

Taha Ahmad
BSc. (H) Physics – GCU, Lahore

Muon g-2 (pronounced *as "gee minus 2"*) experiment is one of the recent advancements in the field of physics. This experiment of particle physics had been performed at Fermi Lab, located in Illinois, near Chicago outside Batavia USA. This lab is controlled by the Department of Energy, United States. The first operation of this experiment started in 2018 and results were collected in 2021. The prime purpose of this experiment was to obtain a precise value of the g-factor of the muon. A **g-factor** (written as dimensionless magnetic moment or g value) is a dimensionless quantity that defines the magnetic moment (μ) and angular momentum of an atom, a nucleus, or a particle. It is a basic constant of proportionality that links the various magnetic moments (μ) of a particle to their azimuthal quantum numbers and a unit of magnetic moment (i.,e., which is usually the Bohr magneton or

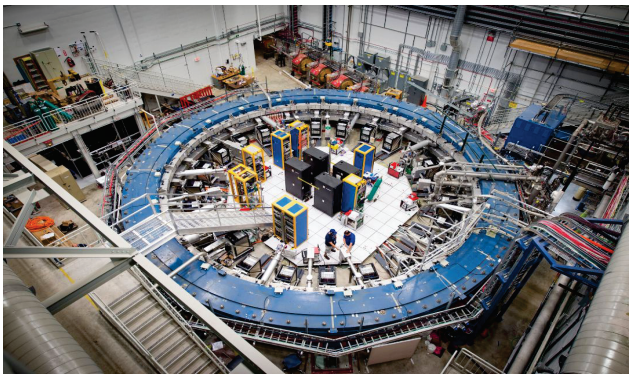
nuclear magneton).

Results obtained from the experiment were remarkable, therefore, it opened a new dimension of discoveries in the field of particle physics.

Muon – the cousin of an electron is itself a bundle of mystery. It is denoted by μ. Muon is a cosmic particle coming from space that belongs to the family of electrons. Its charge is the same as that of an electron but its mass is 200 times that of the electron. This information made the physicists curious and it became a point of interest for many physicists in no time.

The muon has a magnetic field produced by its spinning and its magnetic dipole moment is connected to its g-factor, which has a precisely calculated theoretical value of 2.00233183620(86) in the standard model of particle physics. The formula for the magnetic moment of muon is $\boldsymbol{\mu = g\,(e/2m_{\mu})\,S}$. The μ represents the magnetic moment of the muon, S represents the spin angular momentum of the muon, m_{μ} represents the mass of the muon, and e shows the charge of the muon.

The Brookhaven Lab attempted to find the value of the g-factor of cosmic muons in 2006, but the result was not precise. To improve the accuracy, the experimental setup was shifted to Fermi Lab in 2021. Muons were sent into a circular ring and the detectors measured their speed while interacting with the magnetic field and subatomic particles, affecting their g-factor and magnetic moment. The experiment observed the impact of subatomic particles on the muons' wobble.



Chris Polly - a co-spokesperson of the experiment was one of the scientists who participated in the experiment held at Fermi Lab. He was a graduate student on the lead when the Brookhaven Experiment was taken into consideration. On getting the results of the g-factor muon in 2021, he stated that:

"After the 20 years that have passed since the Brookhaven experiment ended, it is so gratifying to resolve this mystery. So far, we have analyzed less than 6% of the data that the experiment will eventually collect. Although these first results are telling us that there is an intriguing difference with the standard model, we will learn much more in the next couple of years."

Joe Lykken - Deputy Director of Research at Fermi Lab stated that:

"Pinning down the subtle behavior of muons is a remarkable achievement that will guide the search for physics beyond the standard model for years to come."

After the results of the notable experiment, some scientists do believe that there is something that must be missing in the Standard Model of muon that the world has not figured out yet. It is also assumed that there can be an 18th particle existing that is hidden in the world of science so far. Such mysteries provoke scientists to find out more about discoveries. Maybe, shortly, it is likely to see some magnificent observatories in the field of physics.

Does Modern Physics Need To Be Redefined?
Muhammad Umar Fraooq
1443-BH-PHY-21

After a century of revolutionary work by the greatest minds in the field of physics, the thirst for unfolding the mysterious universe has grown over time. Relativity and Quantum Mechanics have changed our view of how we have seen the universe before, but they still cannot be considered correct simultaneously. If a sane man would take a tour of the history of human exploration from Aristotle to Stephen Hawking, he'd find some intriguing questions about the fundamental nature of reality and he'd end up obtaining a typical answer *i.e., nobody knows*.

Four fundamental forces drive the entire universe (i.e., strong force, weak force, electromagnetic force, and gravitational force). Whenever one of these forces was observed and understood, it revolutionized human history. Primarily, *Newton* came up with the idea of gravity and realized that things move by forces and not by mystical spirits. Then, *James Clerk Maxwell* and his electromagnetism separated science into two halves. The world entered the era of the electronic revolution. Soon after, the weak and strong nuclear forces came along with the famous *Einstein equation*. This was the event that encouraged scientists to understand the nature of forces that light up the sky. Nowadays, the

quantum revolution has entirely equipped human power with transistors and lasers and unlocked the secrets of DNA. The road is now bright enough to realize which direction scientific progress may take.

Science is not static. If one tries to count the number of scientific articles being published, he would not be shocked knowing that the sheer volume of science doubles every decade. But, where does all the technical change lead? What could be the final destination? Either it will be controlled by the human mind over nature or will it cease to be chaotic? Certain complex problemsin modern physics had been exacerbated by scientists. Cosmology, itself, is a philosophical beauty but not simpler as it seems. For an instant, the discrepancy in the constant rate of *local expansion of the universe* is not yet defined by any mathematical relation. This discrepancy is known as Hubble Tension Problem which gives the impression to be real. Another discrepancy is in the measuring of the position of stars. The stars are constantly moving and changing their position in space. They approximate the distance of stars by calculating the apparent change between the first reading and the reading of the location of a star after 6 months. While using supernovae to reach galaxies halfway across the universe, it was discovered that the universe is not only expanding but that the *expansion is also accelerating* for the past 5 billion years.

These discrepancies lead to a major paradox that the results for the supernova and the plank do not agree that makes the standard model of cosmology questionable. The study of cosmic mechanisms becomes more puzzling with the addition of the gravity effect. *Vera Rubin* observed in the early 1960s that spiral galaxies were spinning so fast that they would break apart if only the gravity of the visible mass held them together. This was the point where scientists started their research on dark matter and alternatives to the theory of gravity. MOND, TeVeS, and AQuaL theories emerged but instead of solving the discrepancies, they contradicted each other. Therefore, *Kip S Throne* considers gravity to be a "nonsense question".

The structure, shape, and center of the universe are big unresolved problems. It was even thought that magnetism could shape the universe, but new questions ascended about magnetic monopoles. Each obstacle along the way made the scientists to re-examine the mystery of cosmology.

On the other hand, quantum mechanics is restricted to explaining the phenomenon of rotation, the Pauli exclusion principle, and Hund's rule. At some points, it violates the law of conservation of energy and angular momentum. Quantum mechanics is also incompatible with general relativity, especially when it comes to the cosmological constant.

The dream of being able to represent all the basic knowledge about the universe through a single equation is reflected in the history of science. String cosmologists have made progress in this regard but eventually got failed being mathematically complex. Scientists think that this theory can never be refuted as no experiment will be able to prove its correctness. We are left with as many as 10,500 distinct theories. To end up the discussion, all the theories and universe mysteries are documented by scientists who liked to observe nature closely. Science grows every minute and more discoveries will keep the ball rolling.

PSYCHOLOGY



TIMELINE

January, 2022

Robert Enright, PhD, professor of educational psychology at the University of Wisconsin-Madison. developed the 4 items, How Forgiving are You Scale, based on the rationale that our degree of forgiveness varies depending on who hurt us and when and in what context the incident occurred.

February , 2022

A new study published to Frontiers in Aging Neuroscience suggested that your brain may remain active and coordinated during and even after the transition to death, and be programmed to orchestrate the whole ordeal.

March, 2022

March 13-15, 2022: ICSP 2022 – the 7th International Conference on Spirituality and Psychology, Bangkok, Thailand (hybrid conference).

April, 2022

April 2-5, 2022: EPA 2022 – 30th European Congress of Psychiatry, on "Linking clinical practice and research for better health care in Europe.", Budapest, Hungary.

May, 2022

8-10th of May 2022: 2nd International Conference on Trauma and Mental Health – "The Impacts of Trauma and Adversity: Challenges and Innovations", Jerusalem, Israel.

June, 2022

22-25 June, 2022: WADD 2022: 6th World Congress on Dual Disorders, organized by the Mexican Psychiatric Association (APM) and the World Association on Dual Disorders (WADD), Mexico City.

July, 2022

July 20-22, 2022: 4th International Congress of Psychobiology, organized by the Faculty of Psychology and Speech Therapy of the University of Valencia and the Spanish Psychobiology Society (SepPsicoBio), Valencia, Spain.
5-8th of July, 2022: ECP 2022 – 17th European Congress of Psychology – "Psychology as the Hub Science: Opportunities & Responsibility", Ljubljana, Slovenia.

August, 2022

Sander Van et. Al.'s research proved that psychological inoculation improves resilience against misinformation on social media. Inoculation theory has been put forward as a way to reduce susceptibility to misinformation.

September, 2022

26-30 September 2022: 34th EAAP Conference organized by the European Association for Aviation Psychology (EAAP), Gibraltar.
September 21-23, 2022: SEPC 2022 – 32nd International Conference of the Spanish Society for Comparative Psychology (SEPC), Almería (Spain).

October, 2022

October 27-28, 2022: 1st International Conference on Applied Educational Psychology, organized by the Miguel Hernandez University of Elche (UMH), Elche, Alicante (Spain)
3-7 October, 2022: ISCP 2022 – 12th International Congress of Coaching Psychology International Virtual Congress.

November, 2022

16-19 November 2022: 8th International Congress of Clinical and Health Psychology in Children and Adolescents, organized by the AITANA research group at the University of Miguel Hernández, Elx, Elche, Alicante (Spain).
16-18 November, 2022: ICCP 2022 – International Congress of Clinical Psychology (ICCP), (Virtual),

December, 2022

21-22nd December 2022: – 16th International Conference on Psychology & Psychiatry (ICPP), Bangkok, Thailand.

STILL ALICE (2014)



Still, Alice beautifully narrates the tragic tale of Alice Howland, an established linguist expert and professor at Columbia University. Having always been a high achiever throughout her life Alice enjoys a remarkable and envious career and a blissful married life, however, her life takes an unexpected and unfortunate turn when she gets diagnosed with the early onset of Alzheimer's disease at the age of 50. This film provides a window to peep into the rapidly deteriorating life of Alzheimer's patients and their helpless struggle to let go of all the memories they had accumulated throughout their lives. It depicts how the 'once know-it-all, smart and articulate' people are rendered struggling even to recall the name of their firstborn child. This movie also highlights the positive impact an understanding and caring family (or social support) can have in making the life of the patient a little less miserable, by being there for them, as they continue to fall into the abyss of memory impairment.

THE JOKER (2019)

The Joker is a tragic tale of how the insensitivity and indifference of our society at the level of the rich being unable to understand the plight of the poor or the "normal" people failing to empathize with "mentally ill" people, can further harden their lives making them more hopeless and helpless. Arthur Flex is shown to be living in an extremely downtrodden town of Gotham, which is undergoing bankruptcy and sanitation problems. The stand-up comedian is shown to have the symptoms of various disorders, most of them deeply rooted in his extremely traumatic childhood and further aggravated by society's absurd behavior towards him. Not only was he abandoned as a child, but was outcasted by society as an adult too. He was lonely and friendless and was humiliated, made fun of, and beaten up for his mental illnesses. These social factors impacted his mental health negatively and frustrated by it all, the once stand-up comedian became a joker now, who had resorted to the world of crime and chaos, starting an anti-rich movement unintentionally by killing the rich and privileged people who were awful to him. He becomes a symbol of resilience and became the hero of the people who were done with the rich being cold and insensitive. He finally began getting the recognition that he had craved, all his life.



Areesha Ehsan

The Real You
Seemab Fatima

The thin, small, and delicate eggshell contains vibrant life inside it. The flat soft land soil has a growing volcano under it. The simple covering of the bomb has disastrous stuff which can cause an explosive catastrophe. These ordinary-looking things have miraculously powerful happenings inside them. The small seashells that are covered with dirt, have the most precious diamonds inside. All these things have extremely common and ordinary appearances but within them, they are hiding powers and wonders. From the outer figure, we can't guess the number of treasures it is holding. Appearance can't decide the fate of its beholder. Similarly, your appearance can't reveal your strengths. It's merely an illusion, and the reality is inside you. When people judge you by your exterior, they believe in an illusion. When they are measuring your value by your looks, clothes, and exhibition, they are deceiving themselves. If you are not pretty on the outside they will not value you because they are ignorant of the treasures your inner self holds and the wonders you can perform. They will not appraise you, like the person who repudiates the dusty seashell containing precious diamond, because of his inability to see it. Similarly, these superficial people are blind to seeing the real you. But by being blind the reality doesn't disappear. Let them be in the illusion till the day when wonders will come out and spread like shining rays, that will be sparkling enough to fade away the unreal outer images from their eyes. Don't look at yourself from their deceptive eyes that hide your reality behind the specious appearance. You need to believe in yourself because you are the only one who knows your supremacy of yourself.

Appearance is an illusion, the material is the delusion
The real is the soul, the wonder is the whole
The essence is real, the inner is a realm
The outer is fictitious, the external is deceive

Embark on your journey with real knowledge about yourself. And be aware of the wisdom of this sentence. An ordinary steel glass with cool sweet *mashrob* will be preferred over the charming pearl-embellished glass having bitter poison inside. Now it's up to you who you want to be. It's your decision whether you consume all your energies on the apparent charm or want to move towards the acquisition of essence.

"When a true lover of God goes into a tavern the tavern becomes his chamber of prayer, but when a wine bibber goes into the same chamber, it becomes his tavern. In everything we do, it is our hearts that make the difference, not our outer appearances. Sufis do not judge other people on how they look or who they are. When a Sufi stares at someone, he keeps both eyes closed and instead opens a third eye_ the eye that sees the inner realm."

~Shams of Tabriz~
(Forty rules of love)

We are not Sufis, we are not angels, and we are not God But we are created in the image of God, Who respects the differences and who pours the soul He has put His eye in our hearts that see the beauty Divine is saying the err, open that eye to see the glory This is the thing that at least you should do, Open the eye that can see the true.





Shopaholic Mania? Shopping becomes a Compulsion
Syeda Ramish



Have you ever shopped more than you can afford? Have you ever gone shopping in reaction to feeling sad or angry? Do you shop to feel less guilty related to the previous spree of shopping? Do you lose control over your shopping behavior? YES or NO? If Yes? Then do you know what is it? It is a phenomenon called **Shopaholic Mania**, also known as Shopaholism, and can be defined as a phenomenon when the behavior of shopping becomes compulsive and the individual no longer has control over it.





There are different types of shopaholics. Let's identify in which category you fall. Have you ever shopped while feeling emotionally distressed? If yes? Then you're a **compulsive shopaholic**. Do you always try to shop for something perfect? If Yes? Then you belong to the class of **trophy shopaholics**. One of my friends always tries to shop for items when they are on sale. She comes under the category of a **Bargain seeker shopaholic**. Have you ever found yourself caught in the vicious cycle of compulsive buying? If Yes? Then you're most probably a **Bulimic Shopaholic**. You're a **Collector shopaholic** if you have this tendency you feel incomplete unless you have every item or every piece of a set.

Causes of Shopaholism





According to Engs (2010), Shopaholism is also called Oniomania or Compulsive Buying. Causes Include:

1. A person becomes shopaholic due to seasonal balm of anxiety, depression and loneliness especially in season of december



2. If an individual feels that this shopping behavior will help him/her in boosting self-esteem, heal hurts of him/her stresses, regrets and problems related to daily life.



3. It maybe due to how our brain feels at that moment. It is stated that our brain relases happy hormones i.e. dopamine and endorphins when we are happy and over the passage of time, these feelings of happiness become the cause of addiction to shopping via reinforcement.



Ways to identify if you're a shopaholic?

- It is more common among women than men (O'Guinn & Faber, 1989),
- Shopaholics buy things they do not need
- Compulsive buying is only in the season of December or holidays when a person is free
- There are racks of possessions and clothes with price tags on them but they prefer buying something new on every visit to shopping malls or shops.
- They go for this intention to buy one or two things only but come back with shopping bags and shopping bags of purchases
- They try to hide compulsive shopping with others to avoid criticism and clashes (Tyagi & Shyam, 2019)
- They will be seen in a state of denial about this problem
- Try to hide this problem in form of doing extra jobs.



Shopaholic Mania- Now-a-days an "Add to cart" Addiction



In this e-commerce era where everything is available online and we can just tap "Add to cart" and can buy whatever we like online. Online shopping has a dark side in form of shopaholic mania where people start buying without even thinking. The ease and rapid growth of the online shopping "add to cart" option has aggravated this compulsive buying. The triggering factor behind this online shopping is mega-sale from different brands throughout the year such as the 11/11 sale, Blessed Friday sale, Mid-Season Sale, Khaadi Anniversary Sale, New Year Sale, and the list goes on.



Ways to prevent yourself from Shopaholic Mania (Engs, 2010)

- Make a list before shopping and try to buy only these things on the list
- Keep only one debit card just to avoid any emergency
- Avoid visiting all those discount warehouses. As if you visit such places then allocate a certain amount for it.
- Do exercise when an urge of shopping comes in to distract from that urge
- Avoid visiting every online shopping platform when you see that they are on sale

The Psychology of Binge Watching
Areesha Ehsan

Gone are the days when we would wait for days on end to watch the next episode of our favorite show. Gone are the days of bearing with the suspense for an entire week to see how the cliffhanger of the previous episode gets resolved. The emergence of OTT platforms has given birth to the new trend of consuming content; of them being binge-watching; defined as the habit of watching various episodes (2-3) of a TV program in a manner of rapid succession in one go. A surge in bingewatching can be traced back to the pandemic, with the data revealing that the number of participants who indulged in it rose from 15% to 33%; thereby rendering it an interesting enough phenomenon to be taken up by psychologists and scientists.

Edward Titchener, a British psychologist, believes that humans become immersed in complex and emotionally-charged stories because of our ability to recognize and empathize with the feelings of others. these empathetic feelings; the very essence of us social beings, contribute to our connection with and compulsions (binge-watching, etc.,) towards even the fictional characters which makes it hard for us to resist any interruption or break in this connection.

The act of binge-watching can also be linked to certain personality types, research findings indicate that high levels of introversion and neuroticism, low self-esteem, and conscientiousness and isolation are significant predictors of binge-watching behavior.

Speaking from the behaviorist perspective in psychology, the pattern of any behavior can be explained by the concept of reinforcement; the idea that the behaviors which bring about favorable consequences are likely to be repeated. Indulgence in binge-watching causes our brain to produce dopamine, a.k.a. “the happy hormone” which brings about feelings of pleasure and happiness. Our body’s craving for such an internal state motivates us to keep doing more of anything which keeps up the secretion of dopamine which results in our pseudoaddiction to that show. Scientists also believe that the neuronal pathways that get activated in heroin and sex addictions are the same ones that are involved in binge-watching. However, as time progresses our brain produces lesser amounts of dopamine from the same level of activity as we have now built-up tolerance towards it. Consequently, now it takes a more intense level of the same activity to give us that same old feeling of happiness and pleasure which makes binge-watching even harder to stop.

The key findings of a few pieces of research also suggest that for some people, bingewatching might be a coping mechanism for stress. When the stressors of life try to weigh them down, people tend to resort to a medium that allows them to escape from the mundane banalities of life; TV series do just that; they transport you to a world that isn’t as nervewracking to us as our own life and therefore people wish to dwell in it for as long as possible. However, University of Toledo research indicates that binge-watching increases stress, anxiety, and depression because technically we have only sought refuge in an alternate world and have done practically nothing to ameliorate the conditions of our life that we have to return to after shutting down our laptops.

Like they say that excess of everything is bad, binge-watching is known to increase the risk of cardiovascular disorders, binge-eating disorder, and reduction in the quality and quantity of sleep (by giving the pre-sleep arousal), etc. These problems are linked directly to bingewatching as well as the associated sedentary lifestyle. To avoid future health problems, people are advised to pair the act of bingewatching with some sort of physical activity like exercising, knitting or folding laundry, etc. To reduce their dependence on TV shows for the production of dopamine, they should discover alternate means like yoga, meditation, talking to a friend, playing with a pet, or picking up again on an old hobby. Moreover, pacing yourself with the show (a more in-depthwatching focusing on the subtle nuances and tolerating the suspense rather than giving in to it), disabling the auto-play, auditing and limiting your screen time, and setting up an alarm may also prove beneficial.

MBTI- A Tool for Knowing Who “You” Really Are
Zain-ul-Abideen
1443-BH-PSY-19

What comes to your mind? When I say the word " university life"? Although the answers differ among individuals, it usually revolves around three terms: " Companionship, passion, and memories". What plays a key role in deciding our companionship, finding our passion, and eventually creating the memories we will hold on to even after years or decades?

It depends to a large extent on "self-identity". Putting it in a nutshell, self-identity means what our likes and dislikes are and how we react in different situations influenced by various emotions like sadness, happiness, surprise, etc. Knowing who we are can help

us get what we need, rather than what we say or think we want.

Studying humans is nearly impossible if I am truly honest. But based upon modern psychological tools and with the help of basic body language tactics, you can go far from
understanding why some people act the way they do and what controls and excites them. The key difference to understand here is between "self-identity" and " personality". Personality is what we show about ourselves. But self-identity is what we identify ourselves as.

The Psychological Test I would suggest here is. MBTI. It's available on **16personalities.com** It's a multiple-choice questionnaire and it concludes the test with an extensive report on what sort of personality you are, what weaknesses and strengths you hold, and what career will be best suited for you.

People usually put in the wrong answers to the questions because they fill up the answers while thinking about the standards, they have in their mind for themselves. An emotional person may answer the question "How emotional are you? " Falsely, because he may think being emotional is not good or he is unaware that he is the too emotional sort of a person. The important thing to know is that there are no bad attributes to one's personality, they all create a person's personality. Your bad and good habits make "you" unique, believe it or not.

It's essential to have friends and loved ones involved in the test so that they can tell you when you are answering the question wrongly. MBTI with an interview of the individual without making him feel like being interviewed can help get correct results from the MBTI test. The best thing about the MBTI test is it's a community where people share memes of different personality types, making it easier to understand one's self and understand how other personality types operate. Every personality type is denoted by an avatar of who people in this personality type usually look like. Making it easier to spot specific personality types in the crowd. Knowing about ourselves and understanding other personality types will surely help us excel in our social life and to make more like-minded friends and to accomplish our goals.

Structure of personality

Khubaib Nawaz
0454-BH-PSY-18

Imam shah Walli Ullah sketches humans as the combination of two forces i.e. Animality (animalistic tendencies) and spirituality (seraph tendencies). He delineates that these two dispositions exist in the following two ways. When these tendencies are in dissension and either tendency wants to dominate the human body, this condition is called a Contradictory state. When these forces coexist and there is no juxtaposition then the forces are in a situation of Compromise. Animality, as well as spirituality, exist majorly in two forms. The higher animalistic and spiritual tendencies. The lower animalistic and spiritual tendencies.

When Animality and Spirituality in humans are either in contradiction or in a compromise situation they manifest some substantial characteristics that can be witnessed with our senses and cognition. A table can be drawn here to comprehend this theory. Majorly there are eight kinds of personalities based on the puissance of these propensities.

Sr. no	Spiritual tendencies	Animalistic tendencies	Combination of these tendencies
1	Higher	Higher	Contradiction
2	Higher	Lower	Contradiction
3	Lower	Higher	Contradiction
4	Lower	Lower	Contradiction
5	Higher	Higher	Compromise
6	Higher	Lower	Compromise
7	Lower	Higher	Compromise
8	Lower	Lower	Compromise

The persons who have compromise in their propensities i.e., the tendencies coexist. The spirituality descends from its higher position while the Animality ascends and meets at a point to resolve the conflict. They try to comprehend and solve the problems related to the world and religion. Generally, they do not entertain the state of conflict and remain calm. On the other hand, the persons who contradict their propensities i.e., either want to dominate the human body. They remain in a state of conflict until the conflict is resolved when either propensity overwhelms the body. They are eminently away from observable religious practices and focus on their animalistic needs.

First, I will discuss specifically the characteristics of persons having contradictions in their propensities (1,2,3,4)

Those persons who have higher animalistic tendencies i.e. (1,3) require durable worship to depart themselves from bestiality. One thing that must be kept in mind is that propensities are in contradiction and either wants to dominate the body. These persons take part in onerous works as they have higher Animalistic propensities. When these persons get departure from bestiality and have higher Spirituality, they become overwhelmed by religious works, they adhere to the soul of religion and don't bother with observable worship. They do not offer prayers or any other kind of worship that most people consider important. Those who have a contradiction in their forces and have a lower spiritual tendency (3,4) are far away from religion. Those persons who have higher spiritual tendencies specifically (1,2) are excellent at performing remarkable political as well as social tasks, like the capability of performing state tasks and country's politics. These are bold and risky taking and therefore can rule and lead the world. The persons with lower animalistic force (2,4) don't take part in risky work. As they have a lower animalistic tendency and are physically weak as compared to the persons who have a higher animalistic tendency.

Now I will discuss here the characteristics that are produced when there is a compromise in these two properties. (5,6,7,8)

Those persons who have compromise in their tendency and have higher spirituality (5,6) are good at manners of performing and completing responsibilities. The person with higher levels of Animality (5) requires sturdy reverences to control their animalistic tendencies. Those who have lower spirituality and higher animalistic tendency (7) are good at fighting in wars and lifting weights for the sake of security or while in migration. Those who have higher spiritual force (5,6) rule the world and at the same time, they are also leading personalities in religion. They follow the religion strictly. On the other hand, those persons who have lower spiritual tendencies i.e. (7,8) are good followers of the aforementioned personalities (5,6). These persons (7,8) follow the religious instructions strictly. They do the work as per they are dictated.

Persons with superior spiritual and animalistic forces are rare in the world, while people with inferior spiritual forces and inferior animalistic forces are abundant in the world. This can serve as an indicator that there are only a few leaders in this world, while the majority of the people in this world are followers.

A Procrastinator's Guide to Combat Procrastination
Mahnoor Azeemi
0888-RE-BH-PSY-16

Procrastination is a modern-day plague and students are the ones most affected by it. It's an urge to put off or delay a task. Ironically, I am also guilty of it and my editor knows how much I have procrastinated writing this article. So, I thought what's a better topic than procrastination to address this conundrum that afflicts us all? Some psychologists suggest that it is a gap between intention and action. Procrastination can have many reasons being a perfectionist can cause one to delay a task, fear of failure, rebellion against parents and most interestingly thrill seekers can also delay a task deliberately. They do so to create the pressure from procrastination which gives them the thrill they seek.

Every day students fight with themselves mentally and succumb to the clutches of procrastination. Today's world is full of limitless distractions which provide probably the worst working environment ever seen in history.

Steel reviewed many studies about procrastination and proposed that procrastination can be avoided if we can keep in mind the variables that are directly related to it. He said that confidence in one's abilities, the value of the task, your need for immediate gratification, and your impulsiveness are four variables that directly relate to how much one is likely to procrastinate. If a person is confident in his ability to do a task, then there are very low chances he will procrastinate. Similarly, if a task is fun or meaningful and the rewards for completing it are immediate then a person is more likely to avoid procrastination. However, if the rewards come much later then dawdling occurs. Last but not least if a person is easily distracted then procrastination will likely occur. Now that we have identified the variables the main question is what strategies can students deploy to effectively tackle procrastination. Timothy A. Pychyl, a researcher at Ottawa Carlton University suggested four tips to help students conquer procrastination. First and foremost is for students to neutralize the irrationality of human nature. Students should use mental images of the future to get their tasks done instead of succumbing to the urge to procrastinate. For example, to study for an exam students should make a mental image of how gratifying the experience will be of achieving excellence and how embarrassed they would be to leave behind their classmates. Secondly, students should utilize their emotional intelligence. The more emotionally intelligent students will be the more likely they will acknowledge negative emotions like anxiety which leads to procrastination, but not give in to them. Thirdly, students should reduce distractions and avoid checking their phones or gadgets every other second. Last but not least students should cultivate their willpower and be mindful to strengthen self-regulation. If this article reaches out to the readers then I have successfully tackled procrastination with the help of these techniques and you can rest assured these strategies work. Scout's honor!

Social Media Anxiety Experiencing Fear of Missing Out (FOMO)

Hashim Abbas



Yesterday, I missed a friends' day out plan which I was going to attend due to some personal reasons. After canceling my plan, I received a text from my friend "Yaar, come na! we will be having fun-you can do your task at home some other day. He invited me with a pure heart. Before I gave him a genuine reason for not coming, that moment I felt anxious. I put my phone away and what kicked into my mind was FOMO! Suddenly, I felt distracted by everything. Some thoughts started to pop up in my mind "How much fun will they be having -WITHOUT ME!" What happened to me at that moment was Fear of Missing Out (FOMO)".

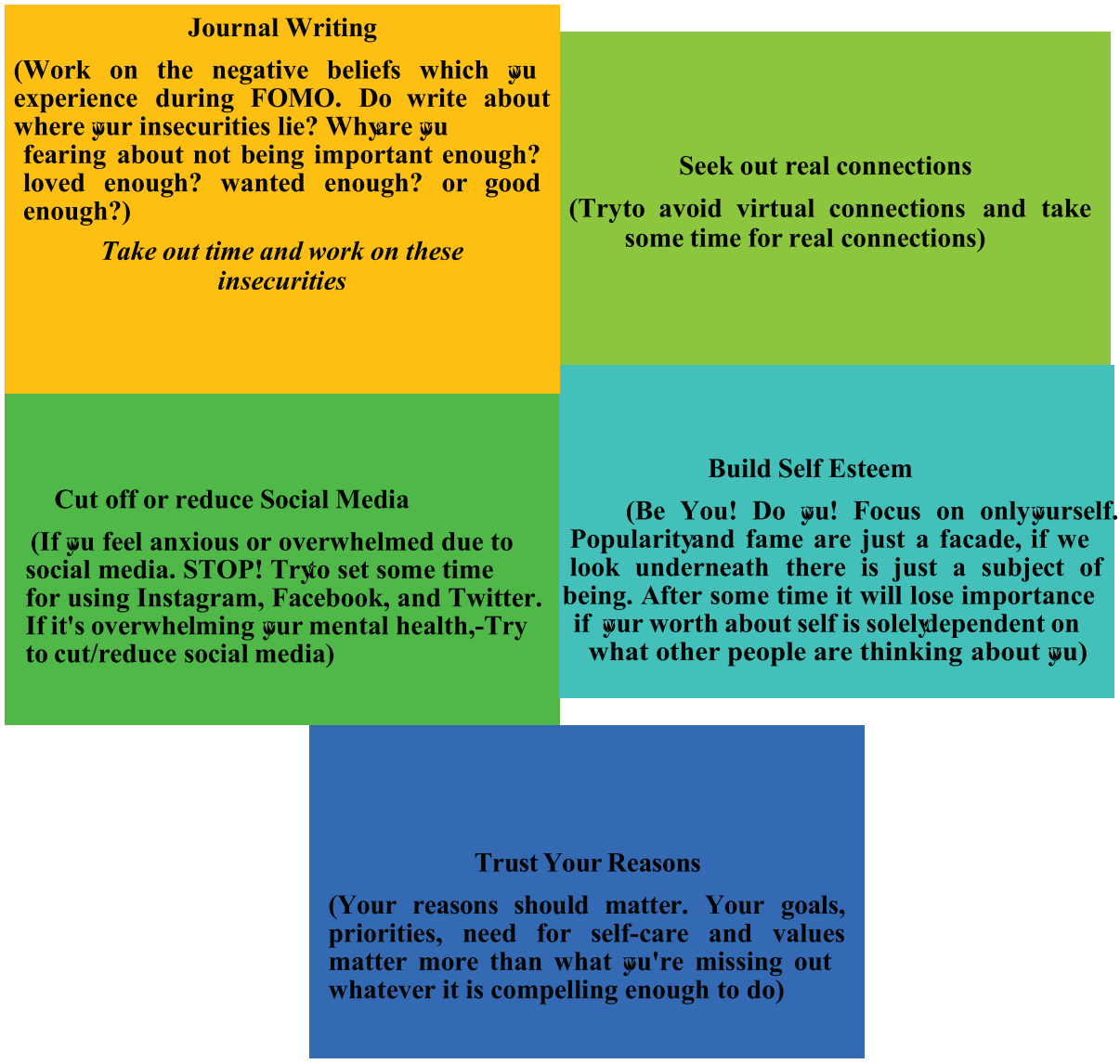
Have you ever experienced FOMO? Fear of missing out is a phenomenon of having anxious feelings which we get when we feel that other people will be having fun or a good time without us. In this digital era, FOMO forces us to constantly check social media i.e. Instagram, Facebook, etc. We constantly check these social media websites to see what our friends are doing. FOMO is defined as *"Pervasive apprehension that others might be having rewarding experiences from one is absent".*





The above-mentioned definition highlights the FOMO and its social aspect that further leads us to regret our past decisions. We miss those experiences that our friends are having. FOMO is considered Social Anxiety It highlights that FOMO is a compulsive concern that one might miss an opportunity or event which is commonly aroused by social media posts. In this digital era, social media has addicted us and made us enthusiasts and fanatics (I can say including "ME"). According to research, Instagram is the worst kind of social media which is dangerous for our mental health and well-being and Snapchat is the second worst. This research also highlights that people who spend two or more than two hours on social media are more likely to experience poor mental health and also symptoms of depression or anxiety after watching pictures of people enjoying themselves and realizing that they are not! It leads to promoting an attitude of "compare and despair" among social media users which give a path to experience FOMO (Fear of Missing Out). **Why FOMO is bad for you?** It keeps us constantly using social media, losing family bonds, mood swings, feelings of inferiority, lowers self-esteem, social anxiety, loneliness, and extreme depression or negativity.

How to deal with FOMO?



In my opinion, FOMO is very much related to lowered self-esteem because when a person has higher self-esteem, he does not care about missing out. Social media has made our life toxic to an extent that constant comparison with our friends and peer circle forces us not to miss out on anything. Peer pressure is another major reason for the anxiety that drives by FOMO. We want to be engaged in everything even if it's not worth your time and needs. This makes unrealistic living standards because we are not doing what we want to or what is our purpose, rather for the sake of peers and friends we tend to say yes to everything to avoid any anxiety related to FOMO.

STATISTICS



TIMELINE

January, 2022

A new technique of using Bayesian inference in deep learning. it allows for more accurate predictions in image recognition, natural language processing, and robotics.

February , 2022

This new method allows AI models to process data more efficiently, this new approach to machine learning focuses on developing algorithms that can autonomously improve their performance without human guidance.

March, 2022

Advancements made in predictive modeling and forecasting techniques. This involves using historical data to predict future trends and outcomes. It can be used to make decisions in areas where accurate predictions are necessary.

April, 2022

New research explores new ways to process and analyze complex data. NLP is a field of computer science and AI that explores new ways to process and analyze complex data, such as voice recognition, machine translation, and text-based search engine optimization.

May, 2022

A new algorithm for clustering offers a more efficient way to analyze large data sets and can be used in applications such as customer segmentation, market segmentation, and disease diagnosis etc

June, 2022

Applying Non-parametric approaches to Statistical Inference. It has been discovered in the recent studies that applying non-parametric approaches to statistical inference are more reliable and can be used in predictive modeling, forecasting, and anomaly detection.

July, 2022

Artificial neural networks are computer systems modeled on the human brain that can learn from experience. A new paper focuses on applying neural networks to time series data analysis.

August, 2022

The research published this month explores new approaches to analyzing high-dimensional data, it refers to the analysis of complex data sets that contain many variables. It can be used in applications such as recommendation systems and facial recognition.

September, 2022

A breakthrough in unsupervised learning will allow machines to learn from data without being explicitly told what to do. Unsupervised learning allows machines to learn for data efficiently without any human assistance.

October, 2022

Research in meta-learning and its applications in AI provides insight into how meta-learning can be used to generate machine learning algorithms and can be applied in various AI tasks such as predicting customer behavior and improving search engine results.

November, 2022

A new method of Bayesian inference, offers more accurate results for data analysis, and can be used in applications such as fraud detection and medical diagnosis.

December, 2022

Reinforcement learning is a type of machine learning that focuses on teaching AI agents' optimal behavior through rewards and punishments. Developments in this field will make it easier to train AI agents.

Applications of Statistics in the world of Data Science
Bilal Khalid
1244-BH(E)-STAT-19

Statistics, according to Karl Pearson, a British mathematician, is the grammar of science. When starting in Data Science or Data Analytics, having statistical skills will help you better use data insights.
"Statistics is the grammar of science." **Karl Pearson**

Data Science is a concept that includes statistics, data analysis, and related methodologies to comprehend and evaluate genuine occurrences using data.

Significance of Statistics in Data Science:
Data Science is the study of data to make healthy assumptions about behaviors and inclinations. To make these hypotheses, the data must be structured according to statistical approaches so that the study can be easier and thus the observations become more precise. When the data is large and disorganized, statistics can be extremely useful. When a corporation employs statistics to obtain breakthroughs, it appears to be a straightforward operation in comparison to the large data that was previously offered.

Statistics eliminates irrelevant details and organizes valuable information in an uncomplicated manner, letting the monumental work of sorting inputs appear pointless and tranquil.

Statistics can help with Data Science in a variety of ways, including

- Statistics aid in the classification of data, determining if it is appropriate for the customer based on past data consumption.

- Probability Distribution and Estimation are critical in comprehending the fundamentals of machine learning and algorithms such as logistic regressions.

- Statistics aid in the selection of optimal data and the elimination of superfluous data dumps for businesses that prefer to keep their operation structured.

- Graphs and infographics, diagrams, reports, and other sorts of data visualizations in the form of interactive and effective interpretations provide far more powerful observations than plain data.

- It also optimizes data to minimize risk while maximizing outcomes.

Data Analysis Using Descriptive and Inferential Statistics
Descriptive statistics are brief informative variables that summarize a specific data collection, which can indicate the complete population or a subset of a population. Measures of central tendency and measures of variability are two types of descriptive statistics (spread). The mean, median, and mode are examples of measurements of central tendency, whereas standard deviation, variance, minimum and maximum variables are examples of measurements of variation.

Inferential Statistics:
Inferential statistics is a field of statistics that employs a variety of statistical procedures to conclude population data from sample data. Inferential statistics aid in drawing assumptions about the population, whereas descriptive statistics summarize the data set's properties

Comprehending Descriptive Statistics:
Anytime Descriptive Analysis is used, it is always done around a central measurement that serves a significant part in defining the outcomes. The Mean, Median, and Mode are the three fundamental variables.

Comprehending Inferential Statistics:
Inferential statistics is more commonly used in analyzing human psychology and comprehending the features of the sentient. To examine the patterns of a general population, we choose a random sample and examine its attributes. The outcomes are next tested to see if they are consistent with the broader population, and eventually, outcomes with definitive information are provided. Hypothesis testing is used by statisticians to determine if a hypothesis is accepted or rejected.

Statistical Data Analysis
The most essential factor in Statistical Data Analysis is identifying frameworks and establishing hypotheses about them. Here are some important Statistical Data Analysis Procedures.

Hypothesis Testing:
As previously said, perhaps one of the foremost significant ways of analysis is hypothesis testing. Furthermore, hypotheses serve as convenient bridges between underlying theory and statistics. The use of precise data in several tests allows the hypothesis to be more accurate.

Classification:
The best popular technique for defining subgroups

from data is classification. In the period of Big Data, it is necessary to consider classic methods such as Classification because the number of observations expands, making computations too complicated.

Regression:
When the variable of interest is assessed, regression methods are the primary tool for determining relationships between variables. The most popular strategy for dealing with inside exponents is simple linear regression.

Time Series Analysis:
Time series analysis is a technique for understanding data and predicting time intervals or temporal structure. Time series are quite frequent in observational data research. Its knowledge is most typically applied in engineering, behavioral sciences, economics, and natural sciences.

Conclusion:
Nowadays, it is difficult to waste even a minute on something unimportant, and our lifestyles reflect this. Everyone appreciates it when their duty is cut to the chase and made user-friendly. Statistics have been up to the task since it was found, and now people understand how amazing it is. It has simplified the lives of numerous industries, including data science. On the other hand, data science is the current vogue, and many great decisions would not have been conceivable without it. So, it is safe to assume that we would not be where we are now if Data Science and, by extension, Statistics did not exist.

Freedom Of Pakistan, A Questionable Reality!
Quart-ul-Ayn Naeem
1248-BH(E)-STAT-19

Each year we raise and rejoice in our independence, defense, and every other day, but as a citizen of Pakistan, I'm constantly haunted by the question that is are we free and independent. Pakistan has endured the toughest of all time over the years, but calling it an independent state is still questionable. What kind of freedom it is where we are crushed by our establishment and political leaders; where each day the citizens of Pakistan are killed by terrorists in the name of religion and our people shake hands with the enemy under the table; where our women are not given protection and equal rights; where because of poverty parents kill their children; where we have a shortage of food, gas, electricity, water, security and absolutely no value of life, and where we are existing independent on IMF and international aid? Each year the defense ministry gets the highest budget, but do we have any idea where it all goes? Does it change every hanging threat to life? The simple and straight answer is No. Money does not train soldiers, money does not guard us citizens and neither would money stop attacks on our people. It is in the entire world's knowledge that Pakistan's economy is in the doldrums. In the past 30 years, Pakistan has been forced to borrow money 16 times from the IMF! Talking about the current and past few years of the economy, when statistics are likened,

it is very obvious that the entire debt and liabilities of Pakistan jumped to Rs53.5 trillion, a gush of Rs23.7 trillion or approximately 80% during that the tenure of Pakistan Tehreek-e-Insaf (PTI). Stating the facts in terms of the size of the economy, Pakistan's total accountability and debt were equal to 76.4% in 2018, which amplified to 80% by March 2022 regardless of the economy rebasing. The statistics are quite clear that the addition of Rs19.5 trillion to the public debt was added by the previous PTI government during its three-and-a-half-year period, which is way more than the accountabilities accumulated by any government reign in 75 years. Being in opposition it is quite easy for these political leaders to make a fool out of their citizens with the promises to deliver and serve for the benefit of this country. But in just 43 months the PTI government left behind its opponents by adding Rs19.5 trillion debts on Pakistan's economy, whereas the Pakistan Muslim League-N add on around Rs10 trillion and the Pakistan People's Party added Rs8 trillion to the debt burden during their tenure.

Statistical Analysis of Pakistan's GDP

Fiscal year	Real GDP growth rate	GDP at current prices (Billion PKR)	US$ to PKR exchange rates	Nominal GDP (Billion US$)	Per capita income (US$)	inflation	Govt. debt to GDP %
FY 2019	Increase 3.12%	Increase 43,798.401	Negative increase 136.09	Decrease 321.334	Decrease 1578	Negative increase 6.6%	Negative increase 67.4%
FY 2021	Increase 5.74%	Increase 55,7555.15	Negative increase 161.02	Increase 346.755	Increase 1576	Negative increase 8.5%	Positive decrease 64.3%

According to the 2022 Index, Pakistan's economic freedom scores 48.8, becoming the 153rd freest economy. Pakistan is ranked 34th in the Asia–Pacific region amongst 39 countries, which overall scores below the local and world norms. In 2019 Pakistan's

economy decelerated and contracted in 2020. Since 2017 Pakistan's overall recorded loss of economic freedom is 4.0 points, directed down by deteriorations in scores for business freedom, the rule of law, and fiscal health, and has dropped to the "Repressed" classification from the "Mostly Unfree" classification. Monetary and Trade freedom illustrates some promise, but persistent lack of the unbiased rule of law looms over economic freedom. 35% is the different income tax rate, while the top corporate tax rate declined to 29%. The total tax burden equals 11.4% of total domestic income. Government spending has amounted to 22.3% of total output (GDP) over the past three years, and budget deficits have averaged 7.8% of GDP. Public debt is equivalent to 87.2% of GDP. The business climate has improved to some extent since 2019, whereas the privatization of state-owned enterprises has been slow. The 2021–2022 budget has increased the subsidies on electricity and gas whereas the IMF has urged the elimination of the same subsidies to establish fiscal discipline in 2021.

From huge fortresses for houses to multinational businesses, and fancy air-conditioned cars our great political leaders are only concerned about what goes into their pockets. Pakistan is going through the toughest of its times. If we aren't able to control this, Pakistan's economy will be ruined and maybe it would take forever to recover from that hole. Concluding this article with a quote: "when you find yourself in a hole, the first thing you should do is stop digging." This is exactly what we should approach. Stop getting ourselves into further debt, encourage taxpayers, increase exports, and decrease imports. It's not just the government's accountability but ours as well.

Data Phobia

Alber Abbas
FAST-NU

Data literacy is used to collect, manage and evaluate data in critical analysis. Individuals make use of data literacy to ask and answer relevant questions as it is the key way organizations use to interpret and analyze results that are later put into context. Without data literacy, organizations are limited in their ability, and individuals are not much successful in critical thinking skills. Therefore, innovation, productivity, and improved decision-making are derived from data literacy.

The importance of such data skills is increasing at a steep rate, such that it has become a necessity in the job market. Hence, employees must have basic data literacy skills for their daily work. 82% of company leaders expect employees to have basic data literacy, and not only is this for necessity, but it is also a beneficial skill at the individual level as it yields one to develop critical thinking and improve problem-solving skills.

Businesses should differentiate between technical literacy and data literacy. Businesses should hire professionals to make the technology being used unchallenging to operate. For example, if we are using 75% time on learning automation and 25% on data literacy, it should be overturned. As a result, that time can be utilized to become data literate.

Only 24% of decision-makers are confident in using data. In businesses, reporting statistics and numbers is commonplace for all. With the help of data literacy, decision-makers can look at data, figure out trends in the numbers and make strategic decisions accordingly, which will help prevent the company from suffering a loss and gain a potentially higher enterprise value.

Another way data skills help to make better decisions is by understanding the data itself. Interpreting, evaluating, and most importantly, asking constructive questions with the data works like an indicator to look at the credibility of the data supporting the question and figuring out a solution. Thus, if any parts are unclear, they can be discussed, and others can take feedback to improve the way the information is shared.

The most crucial factor for all in a workplace is the role that is played by every employee. Every employee has their part in engaging; whether they are already well equipped with data skills or are just at the beginning, all of them are involved in learning and gaining skills. As for those who are leaders, they must ensure that resources are available. Therefore, altogether, developing a curious mindset, being inquisitive, asking and answering questions, and taking feedback are all part of the process of improving decision-making skills. In the UK and Singapore, 78% of employees are willing to invest more time and energy to improve their data set skills.

Although many agree that data literacy is needed for the workforce, some disagree that individuals are not as adequality trained as they are. Forrester conducted research that showed that 79% of leaders said that departments equip employees with data skills, but only 40% have the data skills they are expected to have. This leads to a gap between data training and its implementation. Therefore, it is the job of the leader to ensure that all workers are well-trained and learn the right skills. Additionally, they should provide training workshops for all employees to ensure everyone

invests their time in learning essential data skills. As a result of these workshops, employees will be able to develop their skills and contribute to the organization.

In addition to training, the younger generation is starting to embrace data literacy as well. Overall, 21% of 16 to 24-year old are qualified as data literate because various data skills come in handy for students in their practical life, which in turn also prepares them in advance for future careers. Thus, hiring the younger generation as an intern or employees can be beneficial to the organization, as they will be able to grasp the knowledge effectively and make better decisions from the beginning.

To conclude revolution, efficiency, and governance skills can only be improved with the help of data literacy. Hence, we must keep on increasing our knowledge at a higher pace. For example, just like in this article, data is needed to support the evidence. Data needs to be understood and applied accordingly to make a judgment. Therefore, data literacy is a practical life skill from the basics to the advanced. In the end, a practical decision comes from the productivity gained by data literacy skills.

Forecasting of Malignant Breast Cancer in Women Using Overall and Age-Specific Prevalence based on Shaukat Khanum Memorial Cancer Hospital and Research, Pakistan.

Muhammad Kashif Saleem
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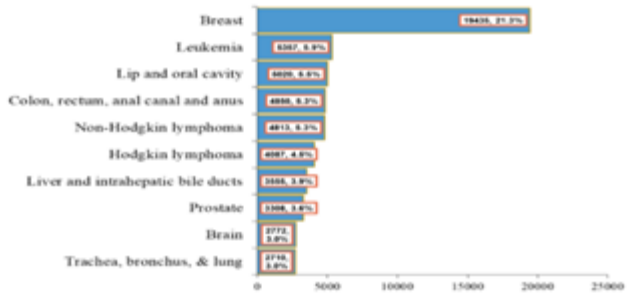
The primary objective of this study is to use the overall and age-specific prevalence of malignant breast cancer in women for future decisionmaking in Pakistan. Being a malignant disease all over the world, cancer is increasing the workload of medical staff. This study targets to increase awareness about the severity of breast cancer among women. Annual cancer registry reports from December 1994 to December 2018 from Shaukat Khanum Memorial Cancer Hospital and Research Centre are used to collect data on the numbers of breast cancer patients are forecasted up to the year 2025 using the ARIMA model with a 95% confidence interval. The age group of 30 to 69 years shows the highest prevalence. The resultant ARIMA model forecast that the number of malignant breast cancer patients will increase up to 1713 in SKMCH&RC from 1256. This study suggests that serious actions are needed to spread awareness about breast cancer.

Breast Cancer in Pakistan

Breast cancer is the malignant and most common disease prevalent in women around the world. Approximately, 2.1 million women are suffering from breast cancer around the world. In 2018, 627,000 deaths are estimated due to breast cancer which is 15% of cancer deaths among women. (WHO) Life expectancy, adoption of a western lifestyle, and urbanization are the main reasons for the increase in breast cancer in the developing world.

Pakistan is at no. 58th in the world rank with a 19.33% rate of breast cancer. Pakistan has the highest rate of breast cancer in Asia. Factors that have most influenced Pakistan are positive family history, diet, smoking, Reproductive Factors cousin marriages, Age at First Child-Birth, Sleep Routine and Night Shift, Obesity, Overweight and Physical Activity, Obesity, Overweight, Physical Activity, experimental exposure, and lifestyle.

SKMCH&RC is the top cancer hospital in Pakistan which is the project of the Shaukat Khanum Memorial Trust. The foundation is the brainchild of Pakistani cricketer Imran Khan whose mother's demise due to cancer influenced him to make a hospital to memorialize her while helping others who are suffering from the same disease as her mother. He started a national campaign fundraising. People contributed everything which was valued, from cash to jewelry. The total expense of the hospital was 677,000,000 (22,200,000 US$).



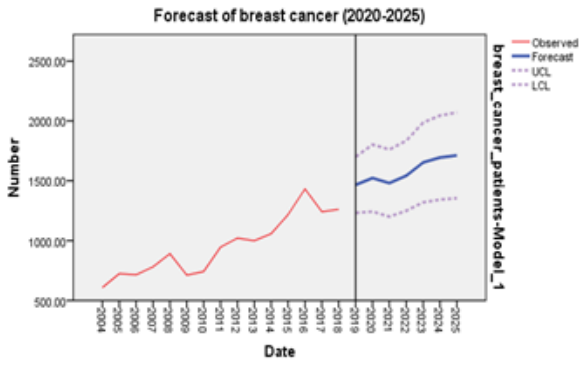
The SKMCH&RC registered 98,823 reported neoplasms and 93,678 patients from 1994 to 2018 (Shaukat Khanum Cancer Registry). 12018 patients with breast cancer are registered in 2021. Most cases are recorded in adult women. The average age of female breast cancer patients in SKMCH&RC is 48.6 years old, with a range of 91 to 6. The majority of the patients belong to Punjab, Pakistan. The highest prevalence of breast cancer in women is from the age group of 30 to 69 years. Breast cancer came in first place with 21.3% of patients among the top ten

malignancies among all age categories of cancer and both sexes in the SKMCH&RC between December 1994 and December 2018. Female breast cancer patients outnumber male patients by a wide margin. Women are developing breast cancer at an increasing rate.

The main objective of this study is to determine and forecast the number of female patients with malignant breast cancer in Pakistani women using the ARIMA model based on the Shaukat Khanum Memorial Cancer Hospital & Research Center, Pakistan's annual reports.

Forecast of breast cancer patients:
ARIMA(2,1,1) is the best-fitted model for forecasting malignant breast cancer in women.

The number of malignant breast cancer women patients in 2018 in SKMCH&RC was 1256. The forecast for women with malignant breast cancer at 95% confidence intervals shows 1713 women with malignant breast cancer with 1355-2070 confidence intervals by 2025 in SKMCH&RC. The data can be collected through other hospitals or resources to find the prevalence. Any other type of cancer can be analyzed from



SKMCH&RC reports. Other forecast methods can be used to forecast the number of breast cancer patients.

Breast Cancer Awareness:
A Pink Ribbon day is fixed in October every year to spread awareness of breast cancer. A lack of understanding, the unwillingness of some women to discuss their health problems with others, and their fear of breast exams result in thousands of female fatalities each year. It needs time to facilitate the females to visit the doctor without any hesitation and do their regular checkups. Some events should be organized on a national level to spread at least the basic knowledge of breast cancer so that females can make self-examination and action should be taken before the big loss."

Lack of Statistical Literacy in Pakistan
Mohsin Ali
3028-BS-STAT-21

Introduction
In today's data-driven technological society all citizens whether they are students, experts, researchers or businessmen deal with statistics from all walks of life. Likewise, university students also use statistics for statistical analysis purposes in research projects. This research study's major goal is to investigate numerous facts of human life to advance prosperity and growth. In this sense, it is impossible to overstate the significance of statistical literacy in all areas of knowledge. Therefore, the primary goal of this study was to assess university students' statistical literacy. The survey revealed that the students at the BS level had poor statistical literacy. The capacity to understand the statistical terminology and symbols used for a population, sample, and inferential statistics is demonstrated by 46% of university students. A smaller proportion of university students 36% understand what central tendencies (mean, median, and variance) are and how to compute them. Descriptive statistics are generally not well understood by university students. Results revealed that 48% of university students could comprehend data visualization, correlation, and its various forms. Only 29% of university students are proficient in inferential statistics, including sample and sampling methods, probability, and probability. Only 19% of university students are proficient in using SPSS to analyze statistical data. Distributions (tdistribution, normal distribution, etc.). (distribution, normal distribution, etc.). 34% of university students are proficient in statistics. At the BS level, there was no noticeable difference between the statistical literacy of students studying social science and applied science. The findings indicated that university students generally understood the symbols and terminologies used in statistics for various reasons. Watson and Kelly, (2008) also probed the low achievements of the students in this respect. Students exhibited low performance in central tendencies.

Lack of Awareness
The current attainment rate of the Islamic Republic of Pakistan is 62.3 which is incredibly low compared to others. Less developed countries like Sri Lanka have a literacy rate of 92.38. The literacy rate of Bangladesh is 74.66. this is often a result of we tend to aren't giving correct tips to our students relating to their careers and education. Once a student completes twelve years of

education, a number of them drop out and began employment because of their financial condition. A significantly low number of students consider continuing their studies. And the trend shows that more and more students register in computer sciences or medical fields. These fields also are glorious however different major and scoping areas are neglected because of a scarcity of correct field tips. Statistics is one of the foremost overlooked. Students don't have any data concerning the sector of statistics they are given no information about the importance of statistics in every area of the field. Most students listed in statistics are learning statistics at an intermediate level and these students have no plan or guidelines about what they will do after graduation. The demand for statistics field in other countries like the USA and Asian countries is incredibly high as compared to Pakistan. in step with the North American Country Bureau of Labor Statistics report, America is the best country for statistics professions. Work approach from 2021 to 2031 there's a far quicker growth than average of around 31% additionally the demand for statistics professions is incredibly high not solely within the US but also in India.

Lack of Opportunity

Statistics isn't solely a field of study it is conjointly but it has some professional and highly needed skills like Data scientist, data analyst, business analyst, financial analyst, actuarial analyst, statistician, biostatistician, etc. But still, due to the lack of opportunities in Pakistan, students don't come to the sphere of statistics. This is because most companies are outsourcing their statistical work to accountants and there is not much demand for the profession of statisticians even within the academic fields. But on the other side, statistical professions are in high demand in our neighboring country. According to "***Times of India***"

"Currently, demand for data scientists is highest in India. Analysts have foretold around 11 million opportunities in data science alone by 2026 in India."

And in America Data scientist demand rate is to grow 36% faster than average from 2021 to 2031, 13,500 jobs are expected annually for data scientists.

Conclusion

The findings indicated that university students have low statistical literacy. It falls short in the data-driven technological society of today. Therefore, it is advised that the higher education commission of Pakistan's (HEC) approved curriculum includes a crucial allotment of practical work that might raise university students' literacy levels in terms of statistics. Since the majority of university students are unfamiliar with how to use the SPSS software for statistical analysis. Therefore, it is advised that university administrators offer training opportunities and organize sessions, seminars, workshops, and other events with the assistance to enhance operational skills using SPSS and other software like Stata, R, NVivo, etc., the Learning Innovation Division (LID) of HEC (Pakistan) was established. Furthermore, it is suggested that the Curriculum Review Committee of HEC (Pakistan) add a separate section about statistical data analysis software to the curricula. I would say that one of the biggest dangers in modern society is that we are raising a generation who needs to understand statistics but we are not giving them the grounding in statistics that they will need.

Sustainable Development Study Center (SDSC)



TIMELINE

January, 2022

The death toll from heavy rains and flooding in Brazil's northeastern state of Bahia rise to 26, with 715,634 people affected.

February , 2022

Tropical Cyclone Batsirai slams into Madagascar's eastern coastline overnight, killing at least 10 people and displacing almost 50,000 people, says the country's disaster management agency.

March, 2022

Large volcano eruption shakes Papua New Guinea, raising tsunami concerns. Death toll from floods battering Australia's east coast rises to 20 as bodies of a man and a woman is discovered in floodwaters in Sydney.

April, 2022

At least 42 people die in floods and landslides caused by a tropical depression, locally known as Agaton, in the Philippines. As many as 45 people are killed after heavy rains caused flooding in South Africa's eastern coastal province of KwaZulu-Natal.

May, 2022

Much of Spain is gripped by a rare heat advisory going into the weekend, with temperatures to reach record levels for May in several cities.

June, 2022

Energy & Sustainability Summit	Dubai, United Arab Emirates | 21 June
Global Innovation Summit 2022	Lisbon, Portugal | 22 June - 23 June
World Urban Forum	Katowice, Poland | 26 June - 30 June

July, 2022

UN Ocean Conference

Lisbon, Portugal | 27 June - 1 July

August, 2022

SIWI World Water Week 2022

Stockholm, Sweden | 23 August - 1 September

September, 2022

Net Zero Conference 2022

Los Angeles, USA | 14 September - 15 September

October, 2022

Net Climate Technology Show 2022

London, The United Kingdom | 19 October - 20 October

At least 22 people are reportedly killed across Bangladesh after Cyclone Sitrang struck the country, forcing around 10 million people to shift to safer areas, while tens of thousands remain marooned awaiting the government's help.

November, 2022

Energy Transition North America 2022

Texas, USA | 9 November - 10 November

December, 2022

Verge Net Zero

Oakland, USA | 6 December - 7 December The Verge NetZero conference aims to help organizations map out their business processes to achieve net-zero targets.

This Changes Everything – The Book

Hilary Weston Writers' Trust Prize for Nonfiction
Observer Book of the Year

Forget everything you believe to be true about climate change. The genuinely uncomfortable truth is that capitalism is at the root of the problem, not carbon. The comforting fact is that we can take advantage of this existential catastrophe to completely overhaul our failing economic structure.

The Shock Doctrine and No Logo author Naomi Klein tackles the gravest peril humanity has ever faced: the war our economic model is waging against life on earth in her most provocative book to date.

The fallacies that are obscuring the climate debate are dispelled by Klein.

The market is supposed to save us, but in reality, our addiction to growth and profit is trapping us deeper and deeper. Even though we have been told it is impossible, we know exactly how to stop using fossil fuels. All it takes is violating every rule in the "free-market" playbook, which includes limiting corporate power, restoring local economies, and regaining our democracies.

Another thing that has been said to us is that humanity is too greedy and self-centered to meet this task. The struggle for the future economy and against irresponsible extraction is already succeeding in ways that are both unexpected and inspirational around the world.

According to Klein, the vocabulary of fires, floods, storms, and droughts is a strong way to convey the idea that climate change is a wake-up call for society. It is no longer just a matter of changing the light bulbs when facing it. Before the world changes so severely that no one is secure, it's about transforming the planet. Either we fly or we drown.

Naomi Klein publishes a book every ten years that redefines its time. For globalization, No Logo did that. The Shock Doctrine altered our perspectives on austerity. The discussion about the turbulent era that is already here is about to be upended by This Changes Everything.

Traz Hassan

E-Waste (An Emerging environmental issue in Pakistan)
(Ahmad Farooq)

Have you ever thought or considered about the afterlife of your favorite electronic gadgets? Mostly the answer we heard to this question is ''NO''. As we know that technology becomes advanced day by day and with that, we also want to upgrade ourselves and our lifestyle due to this we are used to purchasing advanced technology products which is the main cause of generating E-Waste nowadays is a major environmental issue in the world as well as in Pakistan.

Generally, it is observed that on average a person uses an appliance for almost two to five years and then changes it with a new one with more advanced technology, but the question arises have we ever thought that at one time our phones and gadgets were our favorites but we either sold or exchange our favorite ones with new ones to upgrade ourselves with new ones to upgrade our lifestyle but what happens with your gadgets and where at last it ends? So the answer is that our these favorite gadgets in the end becomes waste which is known as electronic waste and E-Waste is one of the main kind of solid waste.

E-Waste is one of the most serious environmental threats in Pakistan as well as in the world because it contains particles that are harmful to our environment and human health as well. It is observed that nearly 38 tons of Ewaste produce from Pakistan locally and 50 tons of waste are being exported as scrap in Pakistan from the developed countries of the world from which a very small quantity of waste is recycled and reused while the rest remains as the most toxic and hazardous waste on our global that degrades our Earth gradually day by day.

It's a time to take action and ponder on it that what we can do to prevent our earth from Ewaste. Pakistan, as we know, is a rapidly growing consumer of the electronic market, and E-waste is also a rapidly growing solid waste all across the world. So, it is necessary to take precautionary measures to remove this kind of solid waste from the earth and for this purpose, all global leaders must take this issue seriously and pay proper attention to solve this dangerous issue.

For proper removal of this waste, we must involve our native society and tell them about the hazardous facts n figures of this waste and their worst impact on our environment as well as on our health with this we also educate our people on how to tackle this waste by using the concept of Up-cycle and Re-cycle.

And how do we remove it from our globe by using the concept of reuse and disposal of waste?

I would also request the government and other organizations to set up small units of the Ewaste Management Center that especially works on E-waste and give ideas and innovation to remove E-waste from our globe. For the organized sustainable disposal of E-waste, I also propose a mechanism in this regard. First of all, we differentiate our appliances into Repairable and Non-Repairable techniques and then we repair these gadgets and sent them into the revamping market from where people can buy reliable products at a very reasonable price whereas the gadgets that are non-repairable we disassemble into different small parts that we can reuse it.

For the proper use of this E-waste, we also need to set up a recycling plant where we use spare parts that we extract from our old devices, and the remaining parts that are not able to use are considered waste and we destroy and dispose of this E-waste sustainably through proper E-waste Management system according to the Federal and Provincial environmental acts and laws related to the environment. So that due to proper management this waste does not destroy our environment. In the end, I just want to say that whenever we purchase a new product from the market we must research it so as responsible citizens we also must dump or dispose of it properly when it becomes waste for us.

COP26 and Environmental Crises of Pakistan:
Fakhar-ul-deen Ali Ahmed
QAU

Currently, one of the major issues that the world is facing is climate change. The main causes of this global problem are the burning of fossil fuels (coal, oil, natural gas), global warming caused by emissions of greenhouse gases like CO2, loss of biodiversity, etc. According to the World Health Organization (WHO), it is the greatest threat to global health. COP26 is the 26th high-level Conference held in Glasgow, UK with the partnership of Italy about climate change. It was held in 2021 with a collective focus to eradicate the problems that are causing environmental issues and hazards, setting up new objectives and aims to minimize or end up the use of fossil fuels i.e.; lessening carbon emissions, and making the world clean and green. The members of the parties made effective talks, agreed, and planned to work collaboratively to reduce the greenhouse gas emissions known as 'nationally determined contributions (NDCs) to reach the

environmental sustainability goals. In short, this conference's main objective was to fulfill the promise of COP21 or 'the Paris agreement.

"1.5C is what we need to stay alive – two degrees is a death sentence for the people of Antigua and Barbuda, for the people of the Maldives, for the people of Dominica and Fiji, for the people of Kenya and Mozambique – and yes, for the people of Samoa and Barbados. We do not want that dreaded death sentence and we have come here today to say 'try harder, try harder. Because our people, the climate army, the world, the planet, needs our action now – not next year, not in the next decade".

Pakistan is one of the most affected and vulnerable countries to climate change. According to Global Climate Risk Index (CRI) 2019 Report, Pakistan took the 8th spot of the most vulnerable and climate-affected countries while the situation became even worse in 2020 when Pakistan climbed to the 5th position with a CRI score of 28.83, with 0.53% losses in unit GDP. In 2021, Pakistan took the 8th position as it was in 2019. CRI score increased to 29.00 with 0.52% losses in unit GDP but still, Pakistan is among the top 10 deeply affected countries by climate change. As the Prime Minister of Barbados Mia Motley while addressing COP26 said that 2 degrees are a sign of death. Pakistan is not taking that seriously. According to the Yale Centre for Environmental Law and Policy, Pakistan ranked 180 in terms of air quality and ranked 142 with an EPI score of 33.1. Lahore and Karachi are known as the Paris of the East. But how? Streets full of garbage, poor drainage systems, and bad quality of air cause several health issues. Increased use of fossil fuels results in emissions of greenhouse gases which in turn causes the depletion of non-renewable energy resources and causes poverty in the population ultimately our country is suffering from huge financial losses. The total debt of Pakistan today is about USD 248.7 billion. This is all due to the negligence of our leaders as well as ours. Last year, environmental development programs like the Ten Billion Tree Tsunami, **the** establishment of national parks, and the restoration of wetlands and wildlife started to reach environmental sustainability goals as different nations in COP26 agreed to make the world carbon neutral. Last year, Pakistan was chosen to host World Environment Day in partnership with UNEP. This year, the Federal Minister for Climate Change Senator Sherry Rehman signed a climate MoU with Korea to open sustainable urban development projects in Pakistan. While addressing the First Plenary of Stockholm, she said that developed countries must reduce fossil fuel emissions. Further, she highlighted the problem of water pollution saying that 90% of our plastics are thrown into oceans and these microplastics are consumed by fish and marine life we eat. At the annual meeting of global leaders at the World Economic Forum 2022 in Davos, she said that the developed world is most responsible for the climate change the world is facing, because of its excessive emissions of greenhouse gases. Countries like New Zealand, Sweden, and Denmark have achieved great success in that battle. The air quality of these countries is exceptional.

Despite many talks at many international conferences, our Ministry of Climate Change is still not successful in reaching environmental sustainability goals. And we all don't know how Pakistan will stand out in this race. I am pursuing my bachelor's degree in Environmental Sciences. Here at my university, all the students perform different activities for the protection of the environment. Clean drive and Tree plantation activities took place last month. The Professors here are planning to make dustbins from the trash of the University. This is the greatest step that every institute in Pakistan should take. Here in Pakistan, a lot of environmental scientists and researchers are working in different universities. Their research works are highly cited in many international journals including 'Elsevier'. Why our Ministry of Climate Change don't appoint such scientists in their cabinet to solve the environmental threats that we are facing? There is an urgent need for technocrats but our climate change ministry is showing negligence. Why?

Hydropower: An opportunity to achieve sustainable energy targets in Pakistan

Gul e Lala
SDSC

Pakistan has the capacity of generating energy through renewable and non-renewable energy resources. It is blessed with all forms of energy resources because of its geographical location in Pakistan. Pakistan is endowed with substantial resources of water. According to the Water and Power Development Authority of Pakistan (WAPDA), Pakistan has the potential to generate 60.000 MW of hydroelectricity. Out of this, only 7320 MW of energy in Pakistan has been developed. Exploration of potential renewable energy resources is required to deal with the current energy crisis in Pakistan. The hydroelectric energy resources of Pakistan generate about 30% of the total energy of the country. It is in use for a long time for energy generation not only in Pakistan but it is used as a potential electricity generation source globally.

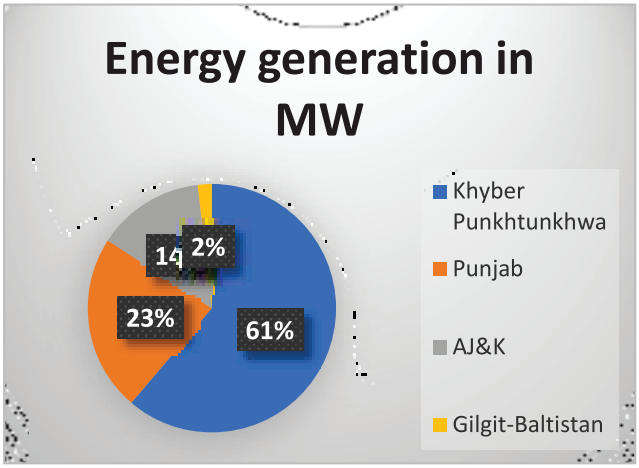
Energy is a crucial factor in the progress and development of any country. Pakistan has been facing problems in the energy sector due for various reasons. The main reason for this energy crisis is the difference between the supply and demand of energy in Pakistan. Pakistan is facing a rapid increase in the overall population of the country. Pakistan with a population of 220 million and an annual growth rate of 2.0 percent is growing rapidly. About 37.2 percent population of Pakistan is urban and the annual rate of change is estimated to be 2.53%. The need for energy has increased tremendously over the last decade due to this population growth. Pakistan is experiencing an energy shortage since 2007 due to a lack of planning, a lack of experts, wrong government policies, and corruption. The supply and demand of the country are mismanaged from the beginning. The supply and demand trend in the country is as shown in the following graph:



Supply and Demand Trends of Pakistan

Pakistan generates a total of 30% of its energy from hydropower. Now Pakistan still lags in enhancing energy production from this renewable source of Pakistan. Though Pakistan has large water resources in the country the country is still not able to reach its potential. The province-wise hydropower generation of Pakistan is given.

Pakistan has the potential to generate a great deal of energy from hydropower but due to various issues, it has been declining and could not reach its potential. Improper infrastructure and unmaintained dams are a hurdle to the advancement of hydropower in Pakistan. The outcomes of such infrastructure would be, erosion of the surface downstream, elevating levels of silt, internal erosion, improper distribution and transmission networks, and unstable slopes. Pakistan's transmission and distribution of energy are not extended all over the rural areas and the cost of extending those electricity grids and lines is uneconomical given the condition of Pakistan. There is a lack of financial support for renewable energy such as hydropower in Pakistan. This is due to a lack of technical and environmental know-how of hydropower potential. If proper dams were made to figure out the rainfall patterns of the country it could have led to increased efficiency of water resources. Along with it, hydropower plants require huge capital costs which discourages the financers. There are sociocultural disputes in Pakistan that act as a hindrance to the development and completion of certain hydropower projects. This reduces the efficiency of the projects



and delays the normal functioning of a planned project. The public has a careless attitude toward the development of the country which acts as an issue to develop. It needed that Pakistan focuses on strategies to overcome the issues that cause hindrances to hydropower energy. Energy Subsidy Transfers are no doubt a bold step but they can prove to be one of the most important steps in fulfilling the gap between generation capacity and availability. For example, the subsidies for kerosene oil could be used for hydropower building instead. This could be very challenging as the burden of subsidy transfer would be faced by both producers and consumers due it would lead to the development of a renewable and sustainable energy sector which would be beneficial in a long run. Proper storage capacity should be taken into account for water resources and multi-purpose projects so that they could begin. Sedimentation of already present reservoirs should be taken under consideration by a proper management team and increase the water accessibility with time rather than reducing it. The law-making body of the country should be an expert in the field so that it may be able to deal adequately and manage the resources in such a way that it reduces the energy gap. Skilled administrators should be hired to operate and manage the staff to increase the feasibility of these projects. The involvement of the public sector should be increased. It could increase the potential of

hydropower projects and would increase public awareness in this regard.

A new form of Bonded Child Labor?
Innocence and dreams are sacrificed at the altar of a modern form of bonded labor
(Maira Razzaq)

Bonded child labor has existed for hundreds and thousands of years now. Various movements and campaigns have been started to end child labor to save these innocent children from being exploited at the hands of their employers. In the past, the children were ideal employees hired by factory owners and businessmen as they were moldable, incapable of holding protests, and worked on meager salaries. For financial stability, poor families would leave their children on contract labor in the form of bonded employees. Pakistan is no exception to this cruelty against children in the past. The story of Iqbal Masih in itself is a glaring example of the clutches and shackles of bonded slavery. The child fought against the discrepancies that he and his fellows had been facing for years. His movement helped many of his peers to get rid of bonded labor but Iqbal was slain in mysterious circumstances in an abandoned field. Iqbal's movement coupled with the advent of International Labor Laws paved the way for the imposition of a ban on child labor and the introduction of labor laws in Pakistan.

In today's time, child labor laws are very well written and beautifully documented. To some extent, child labor has ended but a new form of child labor has sprouted under the shadow of elitism. The same could be witnessed every where but nobody bats an eye. It could be observed in malls and food courts where minors are seen carrying their age fellows or those a year or two younger than them. These children mostly belong to the domestic helpers of these elites. The exploitation costs their employers a few thousand rupees but for the children, it costs them their education, future, and innocence.

This kind of labor is the modern form of child labor. The children are given full fledge responsibility to take care of their age fellows. Many a time, videos make rounds across the internet where the domestic helpers are made to sit at another table while the family enjoys the meal in a restaurant. This is a true manifestation of the menace of elitism. Furthermore, child servants at this tender age are the most vulnerable to being subjected to domestic violence and harassment owing to being naïve. In short term, hiring these children gives a little boost to the economic state of their families but in the longer run, the practice is visibly affecting the literacy rate in Pakistan. These few thousand rupees might help their families for time being but this will strip them of a bright future. The education of such children stops as soon as they enter the struggle of earning a livelihood at a very young age. The children are underpaid and full-time caretakers of their employers' children. It is not a surprise that our out-of-school children's statistics are as high as 22.8 million (children between 5-16 years of age) according to UNICEF as many of these unfortunate children are taking care of their rich age-fellows or doing other forms of child labor.

Apart from child labor at factories, the practice of domestic servitude of children especially by the elites also needs to be stopped. According to the Pakistan Employment of Children Act 1991 as well as article 11 of the Constitution of the Islamic Republic of Pakistan, it is illegal to employ children under the age of 14 and those that violate the act are liable to be penalized. In August 2020, child domestic labor was banned for the first time as it was made illegal to make children participate in domestic labor. It was also recognized by the government that the repercussions of domestic child labor include trauma and abuse. Despite the presence of stringent laws, domestic child labor is still very prevalent in the country, especially in big cities. The issue of domestic child labor is grave but certain actions must be taken to do away with this menace.

The first and foremost task for the government is to implement the available child protection laws in letter and spirit. Violators must be penalized and given exemplary punishment to avert others from hiring children below the prescribed minimum working age. Secondly, the government needs to raise the minimum age to 16 to fulfill the essence of Article 25(A) of the constitution. This will not only avert employers from exploiting young children but will also ensure that these children will be able to avail their basic right to education. Thirdly, it is the responsibility of every citizen of Pakistan to report any cases of underage hiring of children for domestic chores including caretaking of other children. We as citizens should not act as spectators but name and shame such people that feel no shame in hiring and exploiting such unprivileged children. Even if they do take these children as domestic helpers to accompany their parents, it must be ensured that the children are not

hired full-time and that their education is not compromised at the altar of elitism. Those who can fund or sponsor the education of these children should take the lead as by doing so, they would be making the fate of these children and bringing them out of the vortex of perpetual poverty. Fourthly, the media must also play a positive role in sensitizing the masses regarding the menace of domestic child labor and aware people to highlight and report such cases in their vicinities. In addition to this, awareness must be raised regarding the importance of children's education so that parents do not let their children enter domestic servitude or other forms of child labor. Thus, the whole scenario requires collective efforts to eradicate domestic child labor practices across the country. In a nutshell, either another Iqbal Masih is needed today to fight domestic child labor or we must act to break the cycle of child labor to pull people out of the vortex of perpetual poverty.

"Urban Air Pollution and its Abatement"
Rubab Nazar
(Mphil, SDSC)

Globally, people are heading towards urban areas massively to seek the fascinating facilities that urban life offers. This picture keeps a dark reflection in terms of environmental harm. Besides a source of bringing ease to human life, urban life has become a major source of air pollution. One of these urban environmental negativities is a cluster of GHGs being discharged into the air every moment. Urban air pollution has become a global challenge to mitigate the GHGs emissions ($PM_{2.5}$, Pm_{10}, CO_x, VOCs, O3, NO_x, SO_x) associated with it. Open crop burning and fossil fuel burning in the industrial and transportation sectors are the major causes of urban air pollution. In addition to causing environmental degradation, urban air pollution also imposes negative economic and health implications. The need is to realize that there still exist many winning opportunities for abating urban air pollution.

Unfortunately, developing countries are facing more negative impacts of urban air pollution as compared to developed countries. Urban GHGs emissions are responsible for causing various diseases in public, i.e., stroke, heart diseases, lung cancer, and respiratory diseases. Currently, more than 80% of the world's population residing in urban areas is exposed to such high air quality levels which exceed the safe Air Quality Index (AQI) limit of WHO i.e., 10 μg/m_3. According to World Health Organization (WHO), 98% of cities in low and middle-income countries with more than 10000 residents have crossed the WHO air quality guideline while in high-income countries this figure decreases to 56%. According to European Environment Agency, 77% of the urban population in the EU is exposed to $PM_{2.5}$ concentrations exceeding the WHO air quality guidelines. Keeping in view the urban emissions of Pakistan, in 2017 $PM_{2.5}$ concentration in Lahore, Karachi, Peshawar, and Islamabad was 130 μg/m_3, 40 μg/m_3, 63 μg/m_3, and 42 μg/m_3 respectively.

Fossil fuel burning has been discussed dynamically in the existing environmental literature and is the major cause of urban air pollution. Fossil fuel burning is practiced orldwide in the industrial and transportation sector. Likewise, the causes of European urban emissions are mainly fossil fuel burning and agriculture. Globally, the dire need is to increase reliance on renewable energy and cut off fossil fuel burning. Irrespective of the aspect of being a developed and developing country, installing rooftop solar panels in urban areas will generate own household electricity as a cheap approach. Secondly, instead of making the opposing debate about the right of developed and developing counties for exploring fossil fuels, it is essential for every nation to deadly minimize fossil fuel consumption in the industrial sector. This needed step will ensure the abatement of urban GHGs emissions on large scale.

Transforming transportation modes is one of the effective mitigation measures for urban air pollution. Public transportation has always been a suitable idea for reducing fossil fuel consumption in the transportation sector. It will cause a worldwide reduction in the vehicular burden on urban roads and help mitigate the individuals' carbon footprint. Lahore is the second-largest city in Pakistan having a population growth rate of 4% and it is estimated that, currently, there is a total of 6.2 million vehicles in the city out of which 4.2 million are motorcycles. In the developed world with Norway as the top country, E-Mobility has been adopted strongly as a transportation mode in the urban areas which replaces fuel oil, diesel, petrol, gasoline, and Sulphur-laden gas vehicles with e-electric vehicles and, similarly, Hydrogen vehicles are their other approach. However, there exists much flexibility in saying that the electric vehicle revolution should also be adopted in the same manner in the cities of developing countries as there are certain hurdles and uncertainties which need to be resolved. Euro 2, Euro 4 and Euro 6 vehicles are sustainable options as they limit the emissions of Sulphur as shown in table.

Vehicles	*Sulfur Content in Diesel (ppm)*	*Cost per barrel (US$)*	*Health Benefits (US$)*
Euro 2	500	1.5-2.5	2.3-3.5
Euro 4	50	2-3	3-4.6

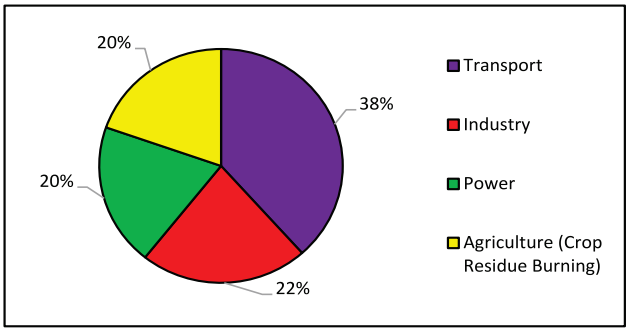
Properties of Euro 2 and Euro 4 vehicles (Source: World Economic Forum, 2022)

The concept of Green Infrastructure needs to be adopted globally as the trend of urbanization seems to keep multiplying in many coming decades. Afforestation is the most hailed solution politically and voluntarily for the urban GHGs abatement. The concept of green infrastructure integrates the application of afforestation in urban areas. Moss walls should be developed in the cities and trees should also be grown along the roadside as it adds to the architectural beauty and absorbs vehicular emissions simultaneously. Such buildings should be designed in cities that have the element of green roofs and accommodate space for creating greenery on their outskirts. More geographical areas must be reserved for parks and green belts. It is all about greening the global urban areas.

Open crop burning in the agricultural sector is another major cause of urban air pollution. Figure 1 shows the contribution of various sectors to urban air pollution in Lahore. Also, crop burning is historically seen as the cause of smog in megacities of London, the USA, and China, and, now, the same crises are evident in urban areas of Pakistan and India due to emitted GHGs. The economic burden of agricultural crop burning on the GDP of Pakistan and India is 5.88% (5.1 trillion $ in the US) and 1.7% (190 billion $ in the US) respectively. Such high economic loss only due to crop burning can be imagined for all the urban areas of the world where this unsustainable agricultural practice exists. GHGs emissions from crop burning can be abated by improving and subsidizing the harvesting machines, and knowing the potential of crop residues for biofuel production and the paper industry.

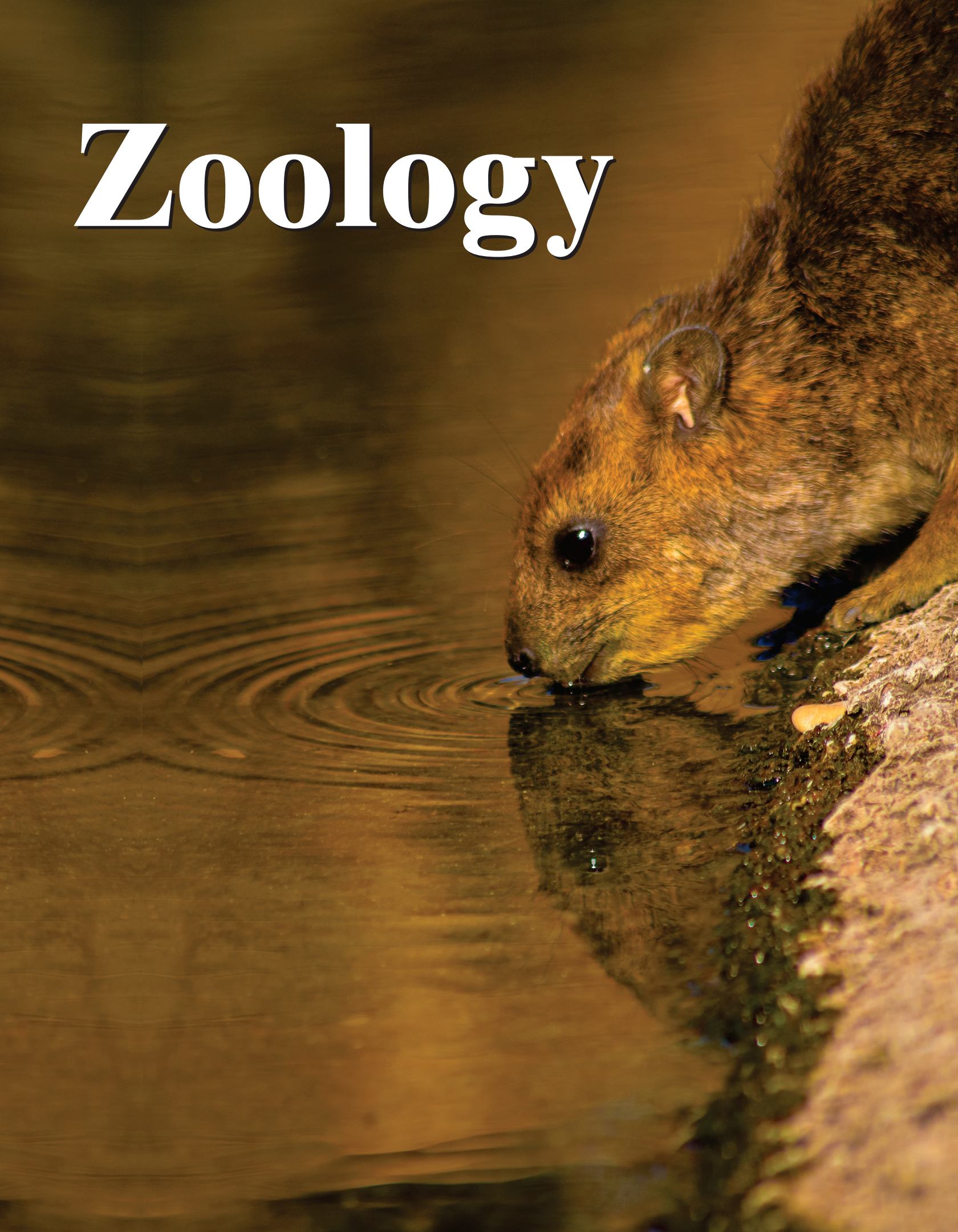
The following actions need to be taken collectively for bringing change to the discussed subject:

- In the modern world, every problem carries a contemporary solution and for the existing scenario, the need is to ensure practicality regarding the mentioned solutions for urban air pollution abatement.
- Policy gaps must be filled and government must take steps to replace fossil fuels by launching renewable energy projects.
- E-mobility and harvesting machines must be subsidized.
- Relevant governmental organizations and NGOs must step forward to green the urban areas to the fullest.
- Administrative bodies should ensure the strict implementation of legislation in the transportation sector.



Air pollution contribution by various sectors in Lahore (Source: EPA, 2021)

Zoology



TIMELINE

January, 2022

Scientists discovered a new method to pull animal DNA out of thin air. It was tested at two different zoos and thought to revolutionize the study of biodiversity in the wild.

February , 2022

Discovery of Omicron in New York Deer Raises Concern Over Possible New Variants. White-tailed deer could become a reservoir for Covid-19, putting people and animals at risk.

March, 2022

A ten-Limbed Octopus Ancestor was described, named After Biden. Octopuses were around 82 million years earlier than scientists previously thought and had two extra limbs at that time. This 330-million-year-old creature was found fossilized in limestone and may be the oldest known relative of octopuses.

April, 2022

A fifteen-year project involving hundreds of experts considering threats to reptile species one by one has concluded that 21 percent of them are at risk of extinction. The study estimates that almost one-fifth of reptile species worldwide will may extinct in the coming time.

May, 2022

In two related studies, researchers describe huge chromosomal rearrangements and about 500 novel gene clusters in the octopus, squid, and cuttlefish genomes, which they say could help explain how they evolved their extraordinary brains.

June, 2022

A team of scientists has discovered an ancient arthropod that may show the origins of branched limbs and the first gill-like breathing structures in the clade.

July, 2022

Oxford biologists are part of an international team that has been modeling the cancer-suppressing p53 gene to identify how 20 different molecules unique to elephants are activated for increased sensitivity and response against carcinogenic conditions – with implications for cancer treatments in humans.

August, 2022

A study revealed that dogs Cry Tears of Joy. Pet dogs produce a larger volume of tears when they are reunited with their owners than with acquaintances, possibly because of surging oxytocin levels. These findings could be the first evidence of emotional crying in nonhuman animals.

September, 2022

An international team has reconstructed the genome organization of the earliest common ancestor of all mammals. The reconstructed ancestral genome could help in understanding the evolution of mammals .

October, 2022

A new species of owl has just been described from Príncipe Island, part of the Democratic Republic of São Tomé and Príncipe in Central Africa. The bird is now officially known as the Principe Scops-Owl or *Otus bikegila*.

November, 2022

The oldest Pterodactylus specimen (flying reptiles of the dinosaur era) was found near Painten, Germany. The fossil is about one million years older than other Pterodactylus specimens. Which is a complete, well-preserved skeleton of a small-sized individual with a 5 cm-long skull.

December, 2022

Two-million-year-old DNA found in frozen soil has been sequenced, revealing a surprising picture of an ancient landscape. Extinct creatures, including, unexpectedly, elephant-like mastodons, turn out to be among the beasts roaming Greenland. Researcher Eske Willerslev explains how DNA found in the environment can be used to reconstruct the past as so-called 'eDNA' becomes a vital tool for paleontologists.

Our Planet

(A documentary series by David Attenborough)



David Attenborough's latest documentary series, "Our Planet," is a remarkable addition to his extensive filmography in nature and conservation. Unlike his previous works which portrayed nature as perfect and untouched, "Our Planet" focuses on the threats facing our planet today and highlights the consequences of human activities. The series comprises eight episodes, each exploring a different landscape, from the Arctic to the jungles of South America, and the deep oceans.

Throughout the series, Attenborough plays the role of an eco-warrior, emphasizing the impact of climate change on the environment and wildlife. He speaks candidly about the harm caused by human beings and encourages viewers to be mindful of their actions. The exceptional camera work and a broad range of techniques used in the documentary make it both aesthetically pleasing and emotionally impactful.

The first episode gives a brief history of our Earth, and the facts are brought to light, such as the wildlife population has decreased by 60% while the human population is increasing continuously, which has put a lot of pressure on our ecosystem. In the documentary's opening scene, he says,"For the first time in human history, the stability of nature can no longer be taken for granted."

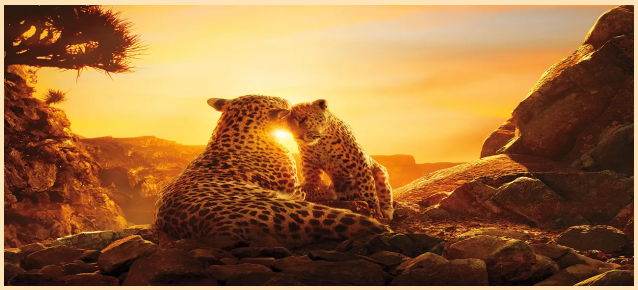


The narration, delivered by Attenborough himself, is thought-provoking, informative, and never dull. His distinctive voice and sincere delivery make it easy to understand and listen to for long periods. The film is a beautiful reminder of the Earth's majesty and a warning of what we stand to lose if we do not take action to protect it. Overall, this documentary is a must-watch for anyone interested in nature, conservation, and the future of our planet. It encourages viewers to be thoughtful about their actions. Moreover, the opening and closing remarks of each episode are the facts that tell us to what extent this damage is affecting the Earth.

After Frozen Worlds there is the episode that takes us to the jungles. We see various preening birds, ants, and honey bees guarding their queen. It follows from the tiniest creatures to apex predators. The scene of the cheetah running after its prey was dropped at that moment when it approaches its target. In this way, the documentary keeps its essence of beauty while conveying its message. Each episode is like a web of life in a particular place, showing the interdependence of species and their interactions with their surroundings. The environment and habitats do look glorious. "Jungles" are a prime example, but there is much more to them, like being unforgiving and fragile at a time. The Rainforest episode ends with an aerial shot of a wild Amazon tree canopy against agricultural palms that was as beautiful as a computer-generated image.



Another thing that makes this documentary great is its exceptional cinematic impressions. The most beautiful views and landscapes are captured and complemented by photography of quite cinematic quality with a broader range of camera techniques rarely seen before. They are not just a feast for the eyes but also expansive and intimate, enhancing the impact of tense and emotional scenes. This step is taken deliberately, and David Attenborough criticizes us without even mentioning that if humans continue to damage the Earth at the rate they are now, its beauty will perish, and coming generations will not be able to breathe in the same environment as we are. They will only be left with such documentaries to appreciate what the Earth used to look like. His message is crystal clear regarding this.





Moreover, there is not even a single person in the whole of his extensive filmography, which is a rarity. From the unparalleled narration to the stunning shots of landscapes and the enormous amount of information about our planet, this movie can impress almost everyone who watches it. The efforts put in by Attenborough make this movie a masterpiece and is highly recommended for animal lovers. At least in my lifetime, I have never watched another movie about wildlife and nature of this caliber. "Our Planet" reveals the true glory of the Earth and alarms us about the real threats it faces today. At the same time, it gives a message of hope so that what is left can be saved. The line from the movie goes like this, if we take care of nature, nature will take care o f us.'The concluding minutes convince us firmly that if we show responsibility, we can still hope for the best.

Qudsia Noor

Animals can be identified through floating DNA

Faiza Tahreem
0627-BHE-Z-19

Zoos are shelter places for animals where they are kept, cared and displayed to the public for entertainment and study purpose. They are also used for the conservation of endangered animals that are at risk of extinction and are also termed **"Animal Parks."** According to recent research, the zoo air apart from the normal air contains the DNA of the animals that inhabit that area. This study was published by two independent research groups that show sampling from the different parts of zoo air contains enough amount of DNA that can be used for the identification of the animals present there. The research is of great importance as it provides a tracking tool for the identification of animals that have been present in an area, thus adding more information to biodiversity. A potential researcher named **Kristine Bohmann** at the University of Copenhagen says that DNA sampling from zoos enables us to detect animals that even are not present there.

Normally the monitoring of animals present in an area requires different methods such as,

- Assessing directly by cameras.
- Personal Observation.

Both these methods are included in the direct estimation while the indirect estimation includes; Animals' leftovers such as Footprints or feces.

Both of these methods are beneficial but the live time presence of animals is important. Similarly, the major drawback of camera monitoring of animals is that it can only be done when the observer has the proper knowledge about when and where to put the camera in the observing field.

DNA monitoring is much more beneficial yet complex at the same time. Airborne sampling is difficult as the DNA is present in very trace amounts in the air, demonstrated by another researcher Elizabeth Clare at the University of London. In our country Pakistan, this method is not more prevalent and observers fail to obtain samples of genes and DNA from the air.

Bohmann and Clare referred to the DNA obtained from the air as **"Environmental DNA"** or **"eDNA"** and used it for monitoring wildlife through the samples of DNA of that area. The major complication in this technique was to avoid contamination of the samples as air surrounds everything. Estimation through this technique can also be used for aquatic animals' monitoring by obtaining samples from the water.

The sample collection was done at various points in the zoo both internally inside the walled area as well as externally in the open air. The exact eDNA sample collection was described by **Christina Lynggaard** at the University of Copenhagen. A fan was adjusted in a determined area that was susceptible to the presence of eDNA with an attached filter.



This fan drew air from that area of the zoo, which contained saliva, feces particles, fur, breath, etc. The next step was to filter the air and extract eDNA from it. Then the extracted DNA was amplified by using the PCR technique and obtained several copies of this eDNA. These copies were then compared with the reference DNA segment and thus identified the different animal species that were expected to be present there.

This whole procedure is not as simple as it seems. Most of the time, the DNA extracted is of minute quantity that it became difficult to assess from which animal it belongs. **Clare's team** from the Queen Mary University of London performed research and was able to identify **25 species** of birds and mammals along with the DNA of endangered species of the UK which was the Eurasian hedgehog. On the other hand, Bohmann's research team collected samples of **49 species** of vertebrates including birds, reptiles, amphibians, fishes, and mammals. All these identified species of vertebrates were non-human. These identified species included zoo animals such as armadillo, guppy, and okapi as well as local animals like house mice and brown rats, both pest animals. Moreover, they also

identified fishes that were used as feed for other animals sheltered in the zoo. Both Clare and Bohmann's team ensured that there was no contamination of the extracted samples even from the DNA that is already stored in the laboratory for testing.

When a researcher selects a particular area let's say a zoo for sampling, he first analyzes that area and determines the native and non-native species so that it becomes easy for them to differentiate between the native species and signals. But in the case of the zoo as a model area, the DNA obtained from there is sure of the one that inhabits the zoo. But for research in open areas such as fields Clare tells us that "When we visited the farm and extracted the DNA of cows, it was necessary to determine whether the cow was native or immigrated from a far-off area."

Both researchers coincidently published their findings independently at the same time in "The Journal of Current Biology" on January 6, 2022. When they saw the work each other they decided to submit the manuscript together. This technique has provided many opportunities and is giving promising results, thus adding more information to biodiversity. However, there is still more research and work needed so that it can be used regularly in the fields and may be in open more open areas. Further information, like how the diluted eDNA is affected by air currents is yet to be answered.



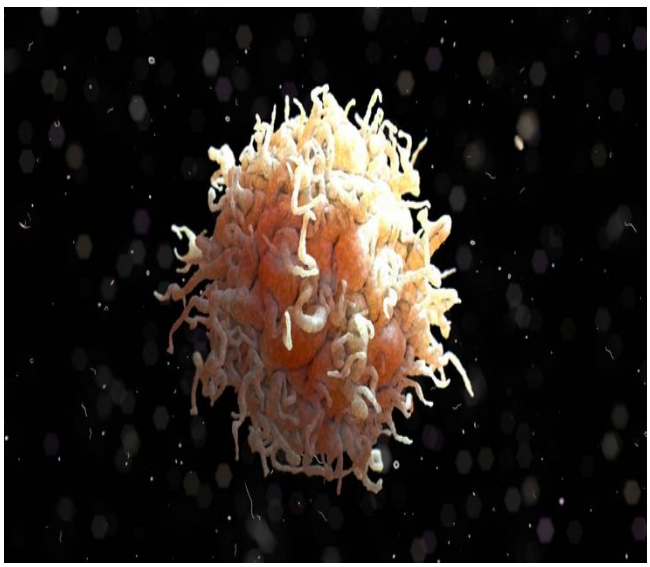
Reverse Aging may be possible in near future…!
Hasnat Sarfaraz Mughal
0849-BH-Z-20

Mankind has always been interested in reverse aging, far before the discovery of the fountain of youth. This curiosity not only persists as we enter the twenty-first century, but has also grown into an obsession. While there isn't much, anyone can do to stop "pathological aging", similarly natural chronological aging cannot be stopped. In the end, aging is characterized by rapid depletion, inflammation, and wear and tear. Because of the significant increases in life expectancy and lifespan, doctors must be mindful of how aging affects the availability of treatment methods. By reducing the time that patients experience the common functional deterioration associated with aging, appropriate therapies tailored to the patient can assist in "compress morbidity." The "health span" will therefore get closer to the life span.

What is reverse aging?

The behavior of discriminating against young people is known as reverse ageism (especially as it pertains to growth and advancement in the workplace).

Old age has a wide range of potential reasons. The suggested causes include the shortening of telomeres, DNA damage, and the depletion of stem cells, to name a few.



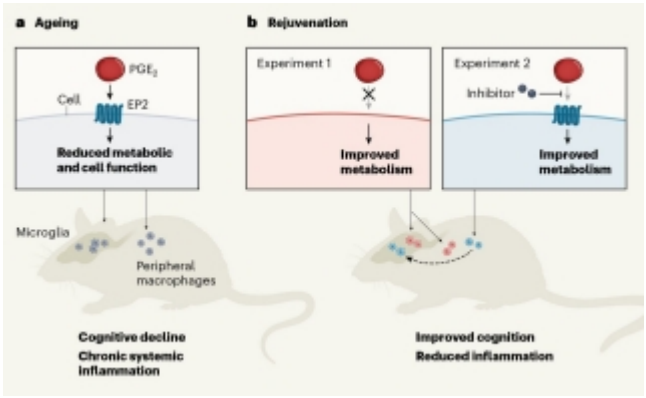
Recent studies have revealed that the macrophage cell type is also essential for aging. Macrophages are phagocytic immune cells that eat other infections and cells that the immune system has identified as hazardous. The amount of energy required by macrophages to consume a pathogen increases significantly. Do you recall learning in biology that mitochondria are the "powerhouse of the cell"? The two basic processes through which cells generate energy are glycolysis and oxidative phosphorylation. Both of these procedures depend on the mitochondria's

ability to transform glucose into ATP, which serves as the cell's "currency" for energy. Researchers discovered that certain "metabolic pathways" in macrophages gradually shut down as they get older.

PGE2 is a crucial enzyme in the regulation of macrophages' pathways, inhibiting glycolysis and oxidative phosphorylation through its interaction with receptor EP2. This interaction activates glycogen synthase, adding glucose to glycogen rather than converting it to ATP, leading to "exhausted" macrophages being unable to produce sufficient ATP for cellular processes. Accumulated cellular waste and inflammation result in cognitive impairment in aging individuals, with evidence suggesting lower PGE2-EP2 interaction may alleviate symptoms.

A new treatment

The goal of the study was to determine if inhibiting PGE2's interaction with EP2 may "reactivate" glycolysis and oxidative phosphorylation and "reverse" aging-related symptoms. To prevent PGE2 from interacting with EP2 and activating glycogen synthase, the receptor would need to be blocked. For the job, researchers used an inhibitor known as C52. The reason C52 was chosen was that it could cross the blood-brain barrier, allowing it to inhibit EP2 not only in the body but also in the brain. This was essential since the macrophages'



ability to clear away debris and slow cognitive decline would be compromised without Ep2 inhibition in the brain. C52 was administered to mice for one month to observe any significant effects of the EP2 inhibition. The outcomes were revolutionary. In addition to having better mitochondrial activity and producing more ATP, mice treated with C52 also had reduced levels of active glycogen synthase and enhanced cognitive function, and reduced inflammation.

For human benefit

Like mice, humans do contain PGE2 and Ep2. Since both humans and mice are animals, it stands to reason that our aging processes are similar. An inhibitor like C52 could have revolutionary implications in easing the symptoms of aging if it is tried on people and proves to be effective. But there are other options than using medicines. Alkaloids, flavonoids, and resveratrol are just a few of the several substances that have been demonstrated to inhibit Ep2.

PGE2 is a key enzyme that affects how macrophages function. Its interaction with the receptor EP2 suppresses energy production and leads to inflammation. Substance resveratrol, present in red wine and grapes, has been shown to inhibit EP2 and decrease PGE2 synthesis, leading to potential benefits for individuals with Alzheimer's disease. Anti-inflammatory drugs have also been shown to decrease PGE2 synthesis and reduce the chance of developing Alzheimer's. However, these findings have only been shown in mice and their effects on humans are unknown. Further research is needed to understand the potential impact of PGE2-EP2 interactions on aging, cognitive decline, and illnesses like Alzheimer's in humans.

Seahorses taking fathering to a new level: pregnancy

Aqsa Rehman
1653-BH-Z-21

A Sea horse is one of the 46 species of the genus Hippocampus. **Hippocampus** comes from an Ancient Greek word meaning **Sea monster** or **Sea animal**. Seahorses have a head and neck suggestive of a horse as well as segmented bony armor, an upright posture, and a curled prehensile tail. Along with the pipefish and sea dragons, they form the **family Syngnathidae**. Sea horses are mainly found in shallow tropical and temperature saltwater throughout the world. They live in sheltered areas such as seagrass beds, estuaries, coral reefs, and mangroves.

Sea horses are very interesting creatures. They remain faithful to one partner throughout life and thus are monogamous. In the breeding season, it is the male seahorse that bears pregnancy and gives birth, which is not usual. This may seem shocking but it is the truth. The female chooses a male and deposits her egg in his brood pouch. A brood pouch is an opening found on the ventral side of the male body.

Before breeding, sea horses may court for several days. During this time, they may change color, swim side by side, hold tails, and wheel around in unison in what is known as a **'predawn dance'**. They eventually engage

in a true courtship dance lasting about 8 hours, during which the male pumps water through the egg pouch on his trunk, which expands and opens to display its emptiness. When the female's egg reaches maturity, she and her mate let go of any anchors and drift upward, snout to snout, out of the seagrass, often spiraling as they rise. They interact for about 6 minutes, reminiscent of courtship. The female then swims away until the next morning, and the male returns to suck up food through his snout. The female inserts her ovipositor into the male's brood pouch and deposits dozens to thousands of eggs. As the female releases her eggs, her body slims while his swells. Both animals then sink back into the seagrass.

The fertilized eggs are then embedded in the pouch wall and become surrounded by spongy tissue. The male supplies the eggs with **prolactin,** and the pouch provides oxygen as well as **a controlled environment incubator.** The egg yolk contributes nourishment to the developing embryos and the male horse contributes additional nutrients in helping them to build their **skeletal system**. The male also offers immunological protection, osmoregulation, gas exchange, and waste transport. The eggs then hatch in the pouch, where the salinity of the water is regulated, this prepares the newborns for life in the sea. Throughout gestation, his mate visits him daily for morning greetings.

The number of young released by the male sea horse averages 100-1000 for most species but or as high as



2500. When the fry is ready to be born, the male expels them through muscular contractions. He typically gives birth at night and is ready for the next batch of eggs by morning when his mate returns. Scientists are studying the sex role reversal in seahorses where the females compete to get the males instead of males competing for females.

The females have secondary sex characteristics such as bright colors and ornamental appearance. Scientists believe that evolutionary steps and hormones have caused this behavior reversal. They are also studying



the evolution of the male seahorses' brood pouch and the genes required for its proper function. The conclusion is that the brood pouch might have evolved independently multiple times in seahorses and pipefish. The reason for male seahorses bearing offspring is not clear, with some researchers proposing it may be due to shorter birth intervals. Female seahorses may experience longer "time-outs" in their reproductive cycle, and depositing eggs is physically draining as it accounts for a large portion of their body weight. Pregnancy in seahorses is unique and complex, serving to ensure their survival.

CRYOPRESERVATION
Haseeb Younus
0760-BH-Z-20

Biodiversity is in a period of intense pressure. Global warming, population increase, climate change, and pollution have placed pressure on the sustainability of the animal environment and reproduction system, but global population growth and mobility have increased the demand for food products. Cryopreservation makes a valuable contribution to conserving animal genetic resources. It allows the storage of genetic material without any impairment for thousands of years. The wealth of Genetic diversity of the world can be put in long-term storage in a biological safe deposit vault. Cryopreservation is the collection and deep freezing of semen, ova, embryos, or tissues for potential future use in breeding or regenerating animals. The basis of



cryopreservation is the capacity of specific tiny molecules to invade cells and stop them from dehydration and forming intracellular ice crystals. Dimethyl sulfoxide (DMSO) and glycerol are two frequently used cryoprotective substances. There are two commonly used cryopreservation methods for animal germplasm, slow-freezing, and vitrification.

Slow freezing involves cooling cells below the freezing point. During slow cooling, ice crystals will form, and in between ice crystals is the unfrozen fraction, in which all cells and all solutes are confined. The concentration of sugars, salts, and cryoprotectants increases while the volume of the unfrozen fraction



decreases. This osmotic strength causes the efflux of water from the cells. Slow cooling prevents intracellular ice formation. In the *vitrification method*, solutes with high concentrations are used to restrict ice formation. Very low amounts of cryoprotectants are used in this process. Vitrification has revolutionized cryopreservation methods. It has been well suitable for storing sperm and ova of warmblooded animals in which Cooling may cause injury and cold shock.

Cooling sometimes causes an imbalance of cellular processes because the rate of one process may be affected more strongly than that of another. Biological materials may be stored in programmable or non-programmable freezers, depending on conditions. In most programmable freezers, straws and vails are cooled by cooled nitrogen vapor. The temperature inside the chamber is continuously maintained. While in non-programmable freezers, the straws are cooled by exposure to a cooled surface at a constant low temperature, like straws placed on racks of Styrofoam boxes with liquid nitrogen. In this case, the temperature difference between the straws and racks determines the rate of heat exchange. During cryopreservation, cells or tissues are placed in a medium, of varying concentrations, containing sugars, electrolytes, glycerol, and other cryoprotectants. The concentration of the cryoprotectants and the relative permeability of the membrane to water and the cryoprotectants determine the degree to which cells shrink and re-swell during the cryopreservation.

Cryopreserved gene banks can have multiple functions and objectives. Their primary function is the conservation of animal germplasm for short, medium, or long-term use. The genetic material from stored gene banks can also be introduced in populations facing genetic problems, for example, genetic material introduced in an in-vivo population can reduce inbreeding levels and broaden genetic diversity. Material stored in cryopreserved gene banks also served as a backup of genetic material. Genetic diversity can be conserved by storing semen, embryos, oocytes, and somatic cells. Semen can be efficiently collected, preserved, and used in many animal species. Sperm-sexing technology is developed and being used in many countries. Backcrossing with the stored semen can restore the breed that is conserved. Embryo banking is a very good option for conserving genetic diversity, in the species with the collection and conserving technologies available.

In 1972, the birth of normal offspring from cryopreserved mouse embryos was reported. To date, there are more than 60,000 genetically modified mouse strains stored in mouse banks around the world. It has been possible to produce lines of embryonic stem cells using the nuclei of brain cells from entire mice that were kept at -20 °C (-4 °F) for almost 15 years. Clones of mice were later created using these cells. Success has been achieved in more than 16 mammalian species. Somatic cells can also be rapidly cryopreserved. The cloning of somatic cells can produce live organisms. It is a relatively simple and cheap method of gene banking. Vietnam has produced a large cryobank-ing system of somatic cells. They have conserved somatic cells of their local breeds. This ensures that they can reconstitute their local breeds if, in the future, they lose. Blood and serum of animals can also be cryopreserved for screening or diagnostic purposes.

Cryopreservation is efficiently coping with the Loss of biodiversity of animal genetic resources. The cryopreserved gene banks offer both in vivo and situ population conservation. It has improved the genetic diversity problems and resulted in greater efficiency. Genetic drift can be overcome using stored genetic germplasm. Cryopreserved genetic material can also

be used in regenerative medicine, for curing genetic defects. Cryopreservation centers around the world use an integrated approach comprised of information systems to address animal germplasm conservation issues.



Cockroach Farming, a breakthrough to combat food shortage

Komal
0837-BH-Z-19

Cockroaches are considered to be bad reputed insects. They are treated like bad creatures and no one likes their presence but nature has its own rules. They are required for the ecological balance; without them, the balance of the environment disturbs. An interesting fact is that some countries have now started farming cockroaches, and it appears to be a good business. After this, the first question strikes our mind is that why people farm them and what benefits they get by farming them. Cockroaches have about **45000** known species and out of which 4 are considered pests and **18** are found suitable for farming. In China, they have been using them as a food source for many years but now they properly farm them. According to World Bank, they provide a solution for the continent's hunger, poverty, and ecological crisis. Cockroach farming was first introduced in China and today China has the world largest cockroach's farms and it is a rising business there. These farms are also present in other countries but are not very common.

Basically,"A cockroach farm is the type of farm where breeding of cockroaches occurs in controlled facilities."

But the first thought that comes to our mind is why China thought of Cockroach farming. As we know, China has the world's largest population so their kitchen wastes are also large. They used to accumulate their kitchen waste in the landfill but gradually, the room in landfills decreased.

Then to deal with this problem, these wastes are fed to cockroaches. These creatures feed on waste and convert these wastes into useful products in the form of crude protein, which is used as food for them. They can grow in number on food craps. Cockroaches are used as a food source in some countries, especially China. They also provide about 14% of crude protein, which



is a food source for livestock animals. Their market will worth up to US **$8 billion** by 2030. A country can earn a lot of profit to support its economy by selling them.



Cockroaches act as saviors in the medical field. They are used in powdered form in traditional Chinese medicine, and in some Asian medicines and cosmetics. One of the biggest farms in China is operated by a pharmaceutical company called "**Good doctor**". They made a "**healing potion"** that was used to treat patients with respiratory, gastric, and other diseases. This potion is confirmed by molecular science and has largescale hospital applications. It has positive effects on certain symptoms. After 10 years of research, scientists are now able to synthesize milk protein

crystals based on the gene structure of cockroaches. They have high caloric content, about thrice the content of buffalo milk. Today researchers are looking for human application of cockroaches' antibiotics, including MRSA, which is resistant to many antibiotics. According to an Entomology professor in China, it can also cure oral and peptic ulcers, skin burns, wounds, and stomach cancer.

Although cockroach farming has great applications, it also has some limitations. As billions of cockroaches are rearing in the same place, so accidental breakdown of these creatures will cause disaster. If this happens, it can cause many types of infections. So, due to this reason, some governments consider it an ethical issue to raise them.

Aside from limitations, cockroach farming is a good business and helps to fight against several diseases. It also reduces kitchen waste. These farms use waste to create new resources. We should encourage such steps, which give a new dimension to science. Farming such creatures that are notorious and using them for the welfare of mankind is a great success for science. Everything in nature has beneficial and harmful effects but it depends on how we handle it.

ADVISOR'S NOTES



Dr. Mina Ilyas
Advisor, Scientific Ravi
Intermediate Studies

I am honored to be a part of this esteemed scientific magazine as an advisor. Scientific advancements have always been the driving force of human progress and development, and it is essential to keep track of the latest developments in this field. This magazine provides a platform for young scientists to showcase their work and receive constructive feedback from peers. This helps in fostering a sense of community among scientists and promotes interdisciplinary collaboration.

I encourage all readers to keep abreast of the latest scientific advancements and to approach science with an open mind and a quest for knowledge.

Lastly, I am sincerely grateful to the Editor for providing the opportunity for Intermediate students to submit their research articles for the first time in the history of the magazine. Apart from this, I wish all the very best to Future Scientists to prosper in every field of their lives.



Prof. Dr. Tehreema Iftikhar
Advisor
Botany

Scientific Ravi is a prestigious platform for aspiring young writers to put forth their amazing and innovative ideas. Playing my role as current advisor and former editor of the Botany section of this esteemed magazine is been a great honor for me. I strongly believe that Scientific Ravi is not only a gateway to scientific knowledge but is also a potential platform to inculcate the love for reading among students that unfortunately has diminished over time. Furthermore, it's a great platform for students to showcase their writing skills. Over the period Scientific Ravi has been turned into an amazing piece of literature that is worth reading. This year too the students of the Botany department have come up with informative and attention-grabbing articles encompassing different global issues and discoveries in Botany that will entertain our readers. Lastly, I extend my best wishes to all the young emerging writers of the Botany department on the fulfillment of this task with full dedication. I am also grateful to our former advisor Dr. Athar Hussain for his untiring efforts in publishing and looking after the Botany section of Scientific Ravi for quite a long.



Dr. Awais Qasim
Advisor
Computer Science

Being associated with Scientific Ravi is indeed a matter of great honor for me. With the rapidly evolving field of Computer Science, a lot of technologies/tools are being invented. Scientific Ravi provides the students of our department with an opportunity to introduce such intentions to everyone else. This can be very motivating for those who have entrepreneurial nature. I do hope that one day we start to also publish the magazine digitally as people these days are too occupied to read printed copies. This will greatly increase the audience.



Dr. Muhammad Mushtaq
Advisor
Chemistry

As we embark on another exciting edition of Scientific Ravi, it is important to reflect on the significance of Chemistry in our daily lives. From the air we breathe to the food we eat, Chemistry is all around us, shaping the world in which we live. As students of science, it is essential that we understand and appreciate the role that Chemistry plays in our existence. Chemistry is an incredibly diverse field that encompasses a wide range of topics, from the chemical reactions that govern our emotions to the molecular structure of the coffee that we drink. In this edition of Scientific Ravi, we have a fascinating range of articles that delve into the intricacies of Chemistry and its applications.

Our chemistry section features articles on the chemistry of emotions, the chemistry of coffee, and 3D printing, which explores the exciting new world of additive manufacturing. We also have an article on the "dancing molecules" that can help to treat paralysis, as well as a piece on the future of chemistry graduates in Pakistan.

I hope that this issue will inspire our readers to explore the incredible world of Chemistry and appreciate the profound impact that it has on our daily lives. As always, we welcome feedback and suggestions from our readers, and we hope that you enjoy this edition of Scientific Ravi.

"Finally, I would like to express my heartfelt gratitude to the hardworking students, the dedicated Associate Editor, and the exceptional Editor, Ms. Maria Siddique, for their unwavering commitment and invaluable contributions to this university magazine.



Dr. Sayyed Sadaqat Hussain Shah,
Advisor
Department of Commerce & Finance

"*The true alchemists do not change lead into gold; they change the world into words*." – *William H. Gass.*
It is an immense pleasure to be a part of this alchemy process, an exceptional effort initiated by the editorial team of Scientific Ravi. Writing makes a man better than before as this is practice giving birth to various world-changing ideas. Moreover, it inculcates in students the selfconfidence of dealing with different dimensions at the same time. This practice aims to embellish their latent talent and to edify the process of inculcating and incorporating their thoughts into firm ideas. The impetus for The Scientific Ravi was to introduce our students to scientific writing in an unnoticed way so that they could be able to create an impression in educational as well as in practical life.



Dr, Alvina Sabah Idrees
Advisor
Economics

Education is inadequate if it cannot inspire a person to change and reflect upon creativity by degenerating new ideas. Writing is a potent weapon and one of the finest means of bringing that change! Scientific Ravi has no doubt been doing its job well in past years that aiding in the dissemination of ideals to the outside world. As an adviser, I enjoyed working with the editorial staff and always found the articles insightful and intriguing. We have highlighted worldwide economic concerns and advancements in this year's edition so that students might be better informed about the most recent events in the world. I'm convinced that the editorial staff this year has honored the legacy of their predecessors and that no stone has been left unturned to deliver the most refined version of the work.



Dr. Tayyab Akhtar
Advisor
Institute of Industrial Biotechnology

Over the last few years, we are evident of an explicit shift from reductionism to System biology, which is a holistic approach to figuring out the complexity of biological systems. It integrates various discrepancies including "omics'' technologies i.e., genomics, transcriptomics, proteomics, and metabolomics. The "Omics" technique is extracting and later combining all gathered information to decipher complicated networks of processes taking place in a living organism. There are not many precedents where data from all omics tools has been integrated to solve complex biological problems. However, the matter of fact is the entire "Omics" tool hinge on the most important "Omics" known as "Econ-omics''. As I work in a region where resources are limited for scientific research, I immensely feel the need of developing collaborations between local scientific communities. The sharing of thoughts and resources is a way forward to overcome the lack of research funding. Additionally, instead of taking part in the "race of publication", collective wisdom is required to lead "issue-based" and "problem-based" research activities. I appreciate the editorial team of Scientific Ravi for working with full zest and serving the scientific community in their full capacity.



M. N. S. Qureshi
Advisor
Physics

Being the advisor of the Physics Department, I take this grand responsibility to bring about quality articles in the field of Physics that are easily understandable for the general readers. All the articles preferred are of a very high standard, covering a range of fascinating topics in the field of physics and showcasing the latest research and developments. I was impressed by the quality of the articles that were submitted for review. The young writers did an excellent job of presenting complex concepts clearly and concisely. The articles are interesting and engaging, and I am confident that our readers will find them informative and thought-provoking as well. I would also like to show my gratitude to Ms. Iqra Aslam (Associate Editor) for her efforts to motivate the students and young researchers regarding their contribution to "The Scientific Ravi" to make the edition a grand success.



Dr. Nasreen Akhtar
Advisor
Psychology

Scientific Ravi is a source of understanding the scholarly knowledge of Psychology more simply and easily. This magazine is an effective platform for those authors and readers who are curious to know about the current trends in Psychology and psycho-social issues faced by our community. It may create awareness about different aspects of mental health and psychological well-being in our educated community. It is also helpful for those who want to know about the psychological interventions applied in the field of Psychology to deal with our everyday problems as well as psychological disorders. The articles included in this magazine will provide food for thought for its readers in addition to satisfying their intellectual curiosity. The authors may feel encouraged, supported, and accomplished by providing their valuable articles related to Psychology and this exercise may motivate them to write more about different topics of Psychology. I am very grateful to the whole team of Scientific Ravi for their efforts and contributions.



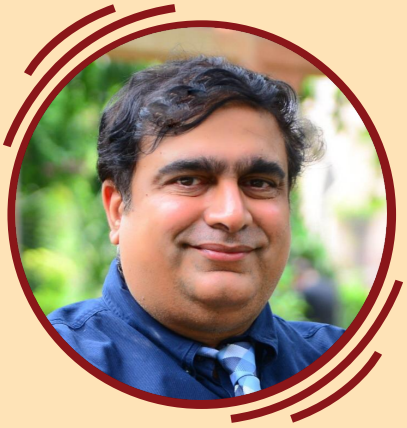
Dr Abdur Razzaque Mughal
Advisor
Department of Statistics

For aspiring young writers, there must be a cooperative platform that emboldens genuineness while it reassures the learning of the skills necessary for writing. Scientific Ravi serves as that necessary platform. to be more creative and experiment with what to say and what not to write. These highly engaging writing encounters help students improve their writing fluency and endurance. At the same time, I was able to support the students by encouraging and teaching them to develop reason. I am happy and excited to be a part of Scientific Ravi. I would also like to thank the magazine as it allows students to polish their writing skills. It gives a voice to their inner thoughts and allows them to communicate them.



Dr. Abdul Stattar Nizami
Advisor
Department of SDSC

I am Dr. Abdul Sattar Nizami An Associate Professor at the Sustainable Development Study Centre at Government College University in Lahore. It is an honor for me to serve as an advisor for the environmental science section of the scientific tutorial team members of scientific. Remarkably, the students involved as associate Editors from each scientific department are gaining a one-of-a-kind opportunity to excel in the art of creative writing, critical reviewing, editing, and proofreading at relatively young ages. In the environmental science area, talented students have written clearly about the knowledge and data on local environmental challenges and the sustainable solutions to those problems. I am ecstatic to announce that this section of environmental science in the magazine is the first document of its kind in the community. It provides an overview of not only the current situations of the environmental management sector of Pakistan but also identifies the potential gates for improvement and keeps players in this section following the new governmental policies over all of the scientific the various management service providers and others take holders to developmental management. A metropolitan and administrative region with improved ecological values and business prospects.



Atif Yaqub, Ph.D.
Advisor
Department of Zology

There is a significant mismatch between opportunity and action in our education system today. Rather than learning to think scientifically, students are generally asked to remember merely scientific facts. This disturbing situation must be corrected if our human resource of science is to have any hope of taking its proper place to meet global needs and face challenges that human civilization will likely face in the future. Currently, we stand at the most crucial turning point in the history of human civilization, where new explorations and revelations are reshaping our understanding of nature and the universe at a very rapid pace. "Scientific Ravi" of Government College University, Lahore, through its history of over three decades, has strived to inculcate the scientific approach among its readers. Zoology, a fundamental science, covers a diverse range of wildlife, ecology, cancer biology, biochemistry, developmental biology, entomology, immunology, animal farming, etc. Zoology enables us to understand our internal universe, which is as complex and as mysterious as the celestial bodies and interstellar space that people have contemplated since humanity's dawn. Living in an era of post-pandemic and climate change, the importance of this subject cannot be undermined. Associate Editor from the Department of Zoology, Ms. Qudsia Noor, has always put her shoulder to the wheel by collecting quality articles from her peers and getting the same into publishable form in the current issue. Indeed, these efforts will prove fructiferous and prolific. I look forward to the team Scientific Ravi 2022, led by the reverend editor, Professor Dr. Aziz-ur-Rehman, earning success and appreciation.

ASSOCIATE EDITOR'S NOTE



Waleed Bin Omer
Associate Editor
Intermediate

As the associate editor of The Scientific Ravi, I am honored to welcome you to our latest edition. Our goal at Scientific Ravi is to provide a platform for the dissemination of cutting-edge research in the scientific community and to foster discussions among experts in various fields. Our authors have put forth their best efforts to present their work in a way that is accessible to a broad audience while maintaining the scientific rigor necessary for peer-reviewed publication. Huge credit goes to the respected Editor who provided the opportunity for Intermediate students to express their research work on such a scale. Moreover, I wish the best of luck to the researchers and sincerely pray for their success.



Shehwar Zehra
Associate Editor
Botany

As a student, I have always felt that we are very much away from reflecting on our ideas and putting forth our analysis on various topics. It is not because of a lack of words but due to the unavailability of a platform where we can freely share our knowledge. Fortunately, Scientific Ravi has not only provided me with a medium but also with all other passionate writers who were looking for any such opportunity. Working as an associate editor of Scientific Ravi was an honorable experience for me. It was a great journey wherein I interacted with several amateur writers who were ready to pen down their ideas. In this edition, you will find interesting articles about discoveries, the latest techniques, and some exciting knowledge pertaining to all subfields of Botany. I hope everyone will enjoy the articles written by botany students with great enthusiasm. Lastly, I would like to extend my gratitude to my teachers for believing in me for this prestigious work.



Rabiyah Nadeem
Associate Editor
Chemistry

As a chemist and the Associate Editor, I am privileged to have a front-row seat to the exciting and innovative developments, continuous advancements, and breakthroughs taking place within the field of chemistry. From breakthroughs in drug discovery to new methods for sustainable energy production, chemistry continues to play a critical role in addressing some of the world's most pressing challenges.

As we look ahead to the future of chemistry, we should be optimistic and confident in the ability of our community to continue to make important contributions to society. With new technologies and innovative approaches, the opportunities for discovery are endless.

Let us take a moment to celebrate the remarkable achievements of our colleagues and the impact that chemistry has had on society.

ASSOCIATE EDITOR'S NOTE



Ali Saqlain
Associate Editor
Department of Commerce & Finance

"*Society lives by faith and develops by science*". – *Henri Frédéric Amiel*
*T*o be able to create a legacy is one of the dreams that every Ravian has. I am one of the few who are lucky enough to do so. First of all, I feel honored to be nominated as the pioneer Associate Editor representing my department in the prestigious magazine. Taking on this huge opportunity brought a hefty responsibility to my shoulders. Being a part of such a talented pool of people, I felt like a novice in the beginning, but I must express gratitude to them for being polite. This journey was difficult yet filled with learning, and I feel indebted. I must thank my departmental advisor, Dr. Sayyed Sadaqat Hussain Shah, for guiding me throughout the journey.



Muhammad Kashif
Associate Editor
Computer Science

As the Associate Editor for the Computer Science department at GCU Lahore, I have had the privilege of working with the talented student body to bring their written works to life in Scientific Ravi magazine. Writing is a powerful tool for self-expression and growth, and I strongly believe in its ability to enrich our lives. From personal reflection to sharing ideas with others, writing can help us communicate more effectively and make our thoughts more clear. I am honored to have served as the Associate Editor for Scientific Ravi magazine, and I look forward to continuing to support and encourage the Computer Science students at GCU Lahore in their writing endeavors.



Zarwa Mahmud
Associate Editor
Economics

Excellence is a gradual result of always striving to be better. Serving as an associate editor for Scientific Ravi this year helped me live by this quote. This year we have tried to incorporate valuable articles which will hopefully give the readers insights into the latest advancements in the field of economics all around the world. We as a team have tried our level best to continue the legacies of our predecessors to deliver the most innovative and knowledgeable content that our readers will be able to enjoy. It has been an honor for me to work with fellow associates and the best names in economics. This was a once-in-a-lifetime experience for me as I got to broaden my horizon for knowledge. This magazine would not have been possible without the utmost effort of the whole team to whom I would love to convey my sincerest gratitude. I would like to thank my Advisor Dr. Alvina Sabah Idrees for her unprecedented guidance and my editor Ms. Maria Siddiqui for her efficient coordination and guidance throughout this journey. It was my privilege to be a part of this prestigious magazine and the esteemed tradition of this university.



Sania Sahreen
Associate Editor
Institute of Industrial Biotechnology

As the scientific developments of this world evolve, it is not only important to make contributions to practical sciences, but also to make them accessible to the general public. The Scientific Ravi has always been an amazing platform where students can learn about new research and discoveries and gain a broad vision of research and experiments. As an Associate Editor, I have had the responsibility to provide the latest quality knowledge in the ever-growing field of Biotechnology & Microbiology. Here you will find carefully crafted and selected articles that will help the reader to understand how the latest technologies can affect our lifestyle. As residents of a developing country, we all need to be aware of emerging trends in Biotechnology & Microbiology. This will not only contribute to the country's progress in the scientific world but also kick-start a new era of scientific discovery in the country. I am heartedly thankful to Dr. Tayyab Akhtar (advisor of Institute of Industrial Biotechnology) for providing me with the opportunity to work for this prestigious magazine. It was an exciting experience to be working as a part of the editorial board of Scientific Ravi. I hope that these golden pieces of writing will lead you to enlightenment. Thank you.



Iqra Aslam
Associate Editor
Physics

The goal of "The Scientific Ravi" is to provide a forum for educators, young researchers, and scientists to educate people about current scientific and technological developments. My experience working as an associate editor has been incredible. This post has helped me to extend my perspective regarding my field and department. It has also helped me improve my management skills. The effort placed in the magazine is by both the editorial team and fellow writers. I would like to extend my sincere gratitude to the managing editor, editor, and advisor of the Physics Department whose expertise, passion, and commitment have ensured that the articles in the magazine are of the highest caliber, providing our readers with valuable insights into this dynamic field. The effort to make science fun and interesting is a challenge that the editorial team takes up every year. I hope that our readers will find this magazine informative and engaging and that it inspires the reader to continue exploring the wonders of physics.



Menaal Maqbool
Associate Editor
Statistics

I, Menaal Maqbool, feel distinguished to be the associate editor of the Scientific Ravi from my department. Being a part of the editorial board for this Magazine is a pleasant and skillenhancing opportunity in my life. I love to read & write and to be given a chance to hold this post, review the first-hand thoughts, and explore the brilliant ideas of fellow students was a big deal to me. This experience provided me with enhanced insights into diversetopics. I hope our reader-friendly effort in this issue shall satiate your quest for knowledge.



Traz Hassan
Associate Editor
SDSC

I'm excited to share what it's been like for me to work as an associate editor (SDSC) for The Scientific Ravi 2021. Contributing to the esteemed publication of Government College University, Lahore, was an enlightening experience for me. Being a part of such a diverse group was incredibly interesting. For instance, Sustainable Development addresses the most prevalent, prominent, and challenging issues in the biological sciences and social sciences in addition to the field of environmental sciences. The writers have also meticulously developed recent research and development in the relevant disciplines. The Scientific Ravi also motivates people to read, write, and learn. Overall, it turned out to be a beautiful center for learning. I'm hoping that reading The Scientific Ravi will help you learn more and identify the best solutions to your difficulties. Finally, I would like to express my sincere appreciation for the outstanding work of the advisor (SDSC), Dr. A. S. Nizami. I also want to thank the editor and all the associate editors for such a wonderful experience.



Qudsia Noor
Associate Editor
Zoology

“Every experience is an opportunity to learn and grow.”
The world is advancing at a faster pace and we are stuck in the race for marks and grades. Most of us read-only course books, and selective reading has become a norm affecting our creative abilities and critical thinking. Good reading leads to good writing. Scientific Ravi Not only provides up-to-date reading stuff but also allows amateur writers so they can show their potential as well as to the members of the editorial board to shape their skills. Being a part of the editorial board of Scientific Ravi was a wholesome experience for me. By collecting articles, proofreading, and editing them, I learned many new things, and the experiences helped me enhance my skills and groom myself. Working with other members of the editorial board, respected teachers, and fellow writers helped me boost my confidence.



"The pursuit of knowledge is a sacred duty. We should strive to understand the secrets of creation and the mysteries of existence, and to use this knowledge to improve the lives of all people and to make the world a better place."

Dr. Abdul Qadeer Khan,
Pakistani Nuclear Physicist, and Metallurgical Engineer

COURAGE TO KNOW