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THE STEM REVIEW

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NEWSLETTER

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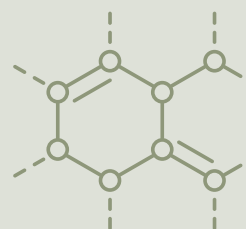
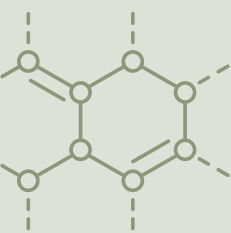
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WELCOME TO OUR NEWSLETTER

A letter from our editor-in-chief



Our first issue



I am tremendously excited to present our first issue, which is a culmination of about 3 months of hard work from our dedicated team of writers, editors, graphic designer, and more.

Read ahead to discover various research breakthroughs that are changing the world, in fields ranging from physics and astronomy, to biology, and even economics.

In this newsletter you will find:



Articles on research breakthrough from various fields, and bonus articles.

The Stem Review

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SECRETS IN THE CLAY

RAAGHAV MODUKURI



A recent study suggests that Mars' early thick atmosphere may be locked up in the planet's clay-rich surface, offering new insights into the Red Planet's ancient climate and potential for habitability. Conducted by a team of researchers from MIT, the study suggests that the clays on Mars could contain significant amounts of carbon dioxide, which once constituted a dense atmosphere. This discovery not only sheds light on the Red Planet's geological history but also opens up exciting possibilities for future space exploration missions.

BACKGROUND

Mars' atmosphere has been one of the most intriguing features of our universe, acting as a barrier between us and understanding the history and composition of possibly one of the first habitable planets. Mars' atmosphere is over 100 times thinner than Earth's and is primarily composed of carbon dioxide, nitrogen and argon gases. Oxidized dust particles kicked up from the Martian surface fill the atmosphere turning Mars' skies a rusty tan color, according to NASA. Water exists on Mars but the atmosphere is too thin for it to last long on the surface in a liquid state. Instead, water on Mars is found below the surface of the polar regions as water-ice and also as seasonal briny water flows down hillsides and crater walls. However, the planet hasn't always been this barren, with composition tracing to an era of flourishing. Early in its history Mars had a thick enough atmosphere for water to run on its surface. According to NASA, some surface features suggest that Mars experienced huge floods about 3.5 billion years ago.

Early Mars likely resembled Earth, with a thicker atmosphere that could have supported lakes, rivers, and possibly even oceans. The planet's surface shows evidence of ancient valleys, riverbeds, and lake basins, indicating that liquid water was once abundant. Scientists believe that Mars' early atmosphere was rich in carbon dioxide, which would have created a greenhouse effect, keeping the planet warm enough to maintain liquid water on its surface. Over time, Mars' atmosphere underwent significant changes. The loss of Mars' magnetic field, which occurred approximately 4.2 billion years ago, left the planet vulnerable to solar wind. This stream of charged particles from the sun gradually stripped away the Martian atmosphere. Without a protective magnetic field, the atmosphere thinned, reducing surface pressure and causing temperatures to drop. This transformation turned Mars from a potentially habitable planet to the cold, arid world we observe today. Today's Martian atmosphere is a thin shell, composed of 95% carbon dioxide, with traces of nitrogen and argon. The atmospheric pressure is only about 610 pascals (0.088 psi), which is less than 1% of Earth's atmospheric pressure at sea level. This thin atmosphere cannot support liquid water on the surface, causing any water that does appear to quickly evaporate or freeze. Despite its thinness, Mars still experiences weather phenomena, including dust storms that can envelop the entire planet, seasonal changes, and even frost.

DETAILS ABOUT THE STUDY

However, recently a part of this mysterious atmospheric hidden veil has been lifted by a group of scientists. A recent study by MIT researchers, published in the journal *Science Advances* on September 25, 2024, suggests that Mars' early thick atmosphere might be locked within its clay-rich surface. The team, led by Joshua Murray and Professor Oliver Jagoutz, proposes that water on Mars could have set off a chain reaction, drawing carbon dioxide (CO₂) out of the atmosphere and converting it into methane stored within clay minerals¹. This process, similar to some interactions observed on Earth, could have sequestered up to 1.7 bar of CO₂, equivalent to around 80% of Mars' initial atmosphere. The researchers believe that this sequestered carbon could potentially be recovered and used as propellant for future missions between Mars and Earth.

“We find that estimates of global clay volumes on Mars are consistent with a significant fraction of Mars’ initial CO₂ being sequestered as organic compounds within the clay-rich crust,” Murray says. “In some ways, Mars’ missing atmosphere could be hiding in plain sight.”

“Where the CO₂ went from an early, thicker atmosphere is a fundamental question in the history of the Mars atmosphere, its climate, and the habitability by microbes,” says Bruce Jakosky, professor emeritus of geology at the University of Colorado and principal investigator on the Mars Atmosphere and Volatile Evolution (MAVEN) mission, which has been orbiting and studying Mars’ upper atmosphere since 2014. Jakosky was not involved with the current study. “Murray and Jagoutz examine the chemical interaction of rocks with the atmosphere as a means of removing CO₂. At the high end of our estimates of how much weathering has occurred, this could be a major process in removing CO₂ from Mars’ early atmosphere.”

This work was supported, in part, by the National Science Foundation. By analyzing data from Mars rovers and orbiters, the researchers identified extensive clay deposits across the Martian surface that potentially contain up to 1.7 bar of CO₂. This amount is equivalent to approximately 80% of Mars’ original thick atmosphere, which played a crucial role in maintaining warmer and wetter conditions on the planet billions of years ago. The study’s findings provide compelling evidence that the disappearance of Mars’ atmosphere could be partly explained by this sequestration process, offering new insights into the planet’s geological and atmospheric history.

IMPLICATIONS

The real question that the layman might ask in this scenario is - what does this mean? Well, there are many implications for this discovery. Firstly, there are practical implications for not just future Mars missions, but also extraterrestrial voyages. The sequestered carbon in Martian clays could be an invaluable resource for creating fuel and other essential materials, potentially enabling long-term human exploration and colonization of the Red Planet.

To elaborate, there is a growing interest and investment in CO₂ utilization technologies, particularly in the areas of carbon capture and utilization (CCU) and carbon dioxide removal (CDR). (38,49,100–102) CCU technologies aim to convert CO₂ into value-added products, such as chemicals, fuels, and building materials. Utilizing this could fuel space exploration. If successful, space-derived materials might translate into a significant increase in the global GDP, with the injection of new wealth generated off-planet. The private space economy is particularly poised to benefit, as private enterprises spearhead the movement towards space industrialization, branching out economic growth beyond Earth's limits.

The implications of the recent MIT study on Mars' ancient atmosphere also extend to our understanding of the Red Planet. By revealing that significant amounts of carbon dioxide could be sequestered in Mars' clay-rich surface, the study provides compelling evidence that Mars once had a much thicker atmosphere, capable of supporting liquid water and potentially life. This new perspective helps to reconstruct Mars' climatic history, offering insights into how the planet transitioned from a warm, wet environment to the cold, arid world we see today. Additionally, understanding the interactions between Martian water and minerals aids in identifying past habitable conditions and guides the search for ancient microbial life. These findings not only enhance our scientific knowledge but also inform future missions, highlighting the potential of using Martian resources to support human exploration and settlement.

In conclusion, this groundbreaking study conducted by MIT researchers offers a transformative perspective on Mars' atmospheric history and its potential for supporting life. By uncovering the significant role of clay minerals in sequestering carbon dioxide, the research not only explains the dramatic reduction of Mars' ancient atmosphere but also opens up innovative possibilities for future missions. As we continue to unravel the mysteries of the Red Planet, these findings will guide scientists and explorers in their quest to understand Mars' past and harness its resources for future human settlement. The potential of utilizing Martian clays for fuel production marks a significant step towards sustainable interplanetary travel, bringing us closer to making Mars a second home.

LOOPS OF WONDER

THE POWER OF CIRCULAR RNA AGAINST CANCER

AKSHAY SANDHYALA



There's no doubt in the fact that cancer takes millions of lives each year, being one of the leading and most prominent causes of death worldwide. Due to this issue, innovative and effective solutions need to be deliberated to ensure treatment and safer lives. One of the hottest new topics that has many prospects in dealing with cancer, is circular RNA, could it be the key to saving patients from cancer, or just another buzz word to forget about?

Circular Successes

Circular RNA or circRNA, for short is a type of RNA (A nucleic acid that helps in many bodily functions like making proteins) that differs from typical RNA, by being circular, forming a covalent loop, making it exponentially more durable than other proteins and RNA, being resistant to exonuclease degradation (a form of RNA death wherein the exonuclease enzyme destroys it). This unique loop structure gives it the unique name, circRNA.

CircRNA is one of the most diverse proteins in our body, and pertain to 3 main functions:

1. Binding with micro RNA(miRNA)- Helps regulate miRNA activity, a type of protein that controls the variation and amount of proteins a cell makes
2. Gene splicing- CircRNA assists in modulating gene transcription and splicing which is crucial for mass producing proteins for bodily functions
3. Peptide encoding- A large number of studies discovered that circRNA, which was generally considered non-coding, could actually code N6-Methyladenosine (m6a), another RNA that helps in many eukaryotic processes, such as mRNA development.

CircRNA on its own is incredible, doing marvels on a cellular level, but its capabilities go far beyond RNA production. In fact, the potential of CircRNA could even help in detecting tumors, and could take its place as the paradigm of cancer treatments.

Rewriting Cancer

CircRNA has the ability to transform cancer itself. They have been some of the most prominent attributes of cancer biology, acting as oncogenes, or cancer suppressors. Cancer cells grow exponentially, which is what makes them lethal. However, CircRNA has been shown to trigger apoptosis (cell death) in cancer cells, destroying them, and helping in regulating cancer.

CircRNA has also earned itself a reputation for being a biomarker that indicates the presence of cancer. According to the Journal for Immunotherapy of cancer (JITC) certain Circular RNA are crucial with tumorigenesis and tumor immunity by helping express immune system molecules like PD-1, that could potentially boost the ability of immune cells in our bodies to identify and attack cancerous tumors better. These RNAs are also apart of signaling cancer pathways and maybe even affecting the way the cancer cells are proliferated, migrated, and invaded (As discussed in the immune cell regulating) which are pivotal in fighting of cancer cells on and below the cellular level.

These benefits are crucial and serve as hallmarks for prospects of utilizing CircRNA for immunotherapy, a form of cancer fighting that uses the body's own immune system to attack cancer cells. In fact, the JITC emphasized the importance of further researching these mysterious nucleic acids that are still vague and new in cancer biology. This has led to the construction of "The Cancer CircRNA Immunome Atlas" or (TCCIA) which they claim is one of the "Methods to address these gaps" and investigate the ties behind these two dimes of biology. The super team of authors and medical researchers led by Shixiang Wang, Yi Xiong, and Yihao Zhang who are all apart of the department of oncology in Zunyi Medical University have firm prospects about the usage of circRNA in cancer, and furthermore that it needs to be researched and better understand as they claim "the detailed roles of circRNA's in cancer immunotherapy are not fully understood," and the TCCIA has accumulating evidence about circRNA's modulation capabilities for immunotherapy outcomes for a large demographic of cancers such as lung, colorectal, pancreatic, and melanoma cancers. circRNA also has its impacts on the tumor microenvironment (TME) as the dysregulation of circRNAs promotes immune destruction, and a reduced immunotherapy efficacy proving that they are a dire requirement for the regulation of cancer in our body. circRNA numbers in various cancers differ, which was concluded after the TCCIA investigated in over 4000 patients, to conclude that bladder cancer exhibits the highest abundance of circRNA, with over 141,085 circRNA pieces. Whereas sarcoma had the lowest amount of circRNAs. The comprehension of the levels of circRNA in the various types of cancers could help us understand circRNA involvements and responsibilities in a wide range of cancers.

Thus we can conclude circular RNA is instrumental in being a suppressor for cancer, a biomarker for cancerous cells, have the capabilities to regulate crucial cancer pathways that could affect the way they spread or grow, and can even act as a stimulus for our immune system to take the battle against cancer quicker and better than ever.

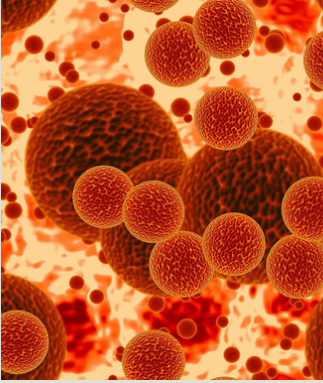
Where is its future?

CircRNA's main hurdle is the lack of the tools required for its detection. Without it, accurate measurements and data can't quantified and therefore useful metrics about its role in cancer and immunotherapy can not be properly deliberated. Yet even so, the usage of Nanopore technology is one of the most significant methods of collecting data about circRNA. If this method is accurately used within the applications of circRNA and oncology, the probabilities of understanding how circRNA can affect cancer will revolutionize the way we se immunotherapy. Despite the challenges it faced due to it being a relatively new and unexplored topic, the capabilities that this small loop of acids and chains possesses could be the key behind putting an end to microscopic wildfire that is cancer, and with so much research and exploration happening in this field, the prospects are endless.

In conclusion, circRNA upholds the potential to save millions of lives, by being an intuitive and microscopic solution that explores fields of biology never before seen. By helping our immune cells fight back against cancer, to controlling the environments wherein tumors form, and also being a hidden gem in the world of immunotherapy, these small insignificant loops of acids could be the turning point and microscopic antidote to a global obstacle.

ENDOMAC PROGENITOR: THE NEWLY DISCOVERED CELL

MICHAEL LUKE JOSE



A nine-year collaborative project involving teams from the South Australian Health and Medical Research Institute (SAHMRI), The University of Adelaide, Baker Heart and Diabetes Institute, and La Trobe University has recently culminated in a groundbreaking discovery. The team has identified a new type of progenitor cell, EndoMac progenitor, which holds great promise for advancing regenerative wound healing applications.

Dr. Sanuri Liyanage from SAHMRI highlighted the remarkable potential of EndoMac progenitor cells, explaining that they can transform into two distinct cell types: endothelial cells, which create blood vessels, and macrophages, which are immune cells that play a crucial role in tissue repair and defense. “These cells are crucial for forming new blood vessels whenever the body requires them,” she stated.

Macrophages are the first immune cells produced by an embryo, playing a crucial role in defending the body against pathogens. After birth, these cells renew themselves to fight pathogens. For over a century, scientists have speculated that circulating stem cells in the bloodstream might be responsible for generating new macrophages. Early studies in mice confirmed that bone-marrow-derived stem cells contributed to macrophage production, continuing into adulthood. However, recent breakthroughs have shown that these bone-marrow cells are restricted to specific tissues, such as the skin, gut, and heart.

PROOF OF A CENTURY OLD HYPOTHESIS

Researchers have long since hypothesized the existence of progenitor cells in the vascular system, capable of differentiating into endothelial and immune cells, but definitive evidence had remained elusive—until now. Their research is shedding light on a surprising source of new macrophages in adulthood—stem cells that were established in the body long before birth.

A team led by Professor Peter Psaltis from SAHMRI has recently identified these cells, known as EndoMac progenitor cells, hidden in the outer layer of aortas in adult mice. These cells seem to originate in the aorta during early development. As mice age, these progenitor cells circulate throughout the body, replenishing tissues with fresh macrophages. Unlike stem cells, which can transform into any type of adult cell, progenitor cells are more specialized, with the ability to differentiate into a subset of specific cell types, like immune cells and endothelial cells.

To evaluate their potential for chronic wound healing and tissue regeneration, Liyanage and her first co-author, SAHMRI biomedical scientist Anna Williamson, along with a team from multiple Australian institutions, cultured EndoMac progenitor cells in the lab and created a small colony. When this colony was injected into the bloodstream of mice with restricted blood flow in their hind legs—a model mimicking diabetic wounds—the injuries healed faster than in control groups. Within two weeks, the circulating progenitor cells transformed into macrophages and endothelial cells, essential for repairing and lining blood vessels, demonstrating their critical role in accelerating healing.

SIGNIFICANCE OF THE FINDINGS

At sites of injury and poor blood flow, EndoMac progenitor cells rapidly proliferate to aid in healing and blood vessel regeneration. The findings are particularly promising for conditions like diabetes, where the body's natural healing abilities are often compromised, as well as for patients struggling with chronic wounds. "This represents a significant advancement in our understanding of blood vessel regeneration and holds promise for creating more effective treatments that support the body's capacity to heal and maintain function over time," Dr. Liyanage said.

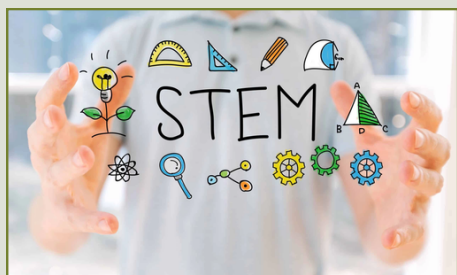
Importantly, these cells also lack the typical markers that cells have for self-recognition, making them a promising candidate for transplantation. Without these 'self' markers, EndoMac progenitors are less likely to trigger an immune response in the recipient, reducing the risk of rejection. Researchers believe this unique characteristic makes them particularly well-suited for stem cell transplantation therapies, as they are much less likely to be attacked by the immune system.

The research team is currently expanding their studies to explore similar progenitor cells in skin and muscle tissue, with results expected in the next 10 months. A crucial next step is the search for EndoMac-like cells in human tissue, which has already shown promising indications. If successful, this could lead to groundbreaking therapeutic applications, particularly for patients suffering from chronic wounds or diabetes-related complications.

The discovery of EndoMac progenitors further enhances our understanding of blood vessel regeneration and could revolutionize tissue repair and regenerative medicine in mammals.

The team's findings were published in Nature Communications.

BONUS ARTICLE BY THE LEADING LADDER INITIATIVE



The Role of STEM in Bridging the Education Gap

Imagine a classroom where one student has access to the latest gadgets, well-trained teachers, and online learning platforms. At the same time, another sits in a bare room with a chalkboard, an outdated textbook, and a teacher trying their best with limited resources. Unfortunately, this isn't just a hypothetical—it's the reality for millions of kids worldwide.

The collaboration between STEM Review, a STEM-based newspaper organization, and The Leading Ladder Initiative, an NGO dedicated to providing education for the underprivileged while offering study tips and stress management techniques to the privileged, is a testament to how technology and passion can come together to make education accessible for all. Let's dive deeper into how STEM is narrowing the educational gap and fostering a culture of equal opportunity. Let's explore how STEM is transforming education and levelling the playing field for students everywhere.

Why Does the Education Gap Exist?

To put it simply, not everyone gets the same shot at learning. For underprivileged students, access to good schools, qualified teachers, and proper learning tools can be rare luxuries. On the other hand, privileged students often have private tutors, extracurricular programs, and even apps that help with everything from math homework to stress management. It's not fair and it's a problem we can't afford to ignore. Education should be a basic right, not a privilege. That's why finding ways to close this gap is so important.

How STEM is Changing the Game

STEM isn't just about coding robots or solving equations, it's about using science and tech to make education more inclusive and accessible. Here's how it's already making a difference:

1. E-Learning: The Classroom Without Walls

Platforms like Khan Academy are game-changers. They offer free or affordable lessons on almost every subject you can think of. A student in a rural village with just a smartphone can now access the same lessons as someone in a fancy urban school.

These platforms are interactive, flexible, and easy to use, making learning engaging for students who might otherwise struggle to stay interested.

2. Affordable Tech Tools

Have you heard of the One Laptop per Child initiative? It's exactly what it sounds like, providing kids with affordable laptops that open up a whole world of knowledge. These tools are especially impactful for underprivileged students who've never had access to digital learning before. Even basic tablets loaded with offline learning content can make a huge difference in places without consistent internet access.

The Stem Review

3. Virtual Reality (VR) and Augmented Reality (AR)

Imagine putting on a VR headset and suddenly being transported to ancient Egypt, or zooming through the solar system. For schools that can't afford field trips or high-tech labs, VR and AR bring the learning experience to them.

It's not just fun, it's effective. Kids learn better when they're immersed in what they're studying, and VR/AR makes that possible.

4. Hands-On Learning with STEM Kits

STEM kits are like science in a box. They come with everything students need to build, experiment, and explore. Schools that can't afford full-scale labs can still give students a chance to dive into hands-on learning.

Portable labs that can be shared among schools are another genius solution. They keep costs down while ensuring that more students can participate.

5. Personalized Learning Through AI

Not every student learns the same way, and that's okay. Artificial intelligence (AI) tools are stepping in to help. These platforms analyze how a student learns and adapt lessons to fit their style.

For example, if a student struggles with fractions but excels in geometry, the platform will provide extra support for fractions while letting them advance in geometry. It's like having a tutor that understands you perfectly.

The Challenges We Need to Tackle

Of course, making STEM accessible to everyone isn't without its challenges:

1. Infrastructure Gaps

Many schools, especially in rural areas, don't even have necessities like electricity or internet. This makes it hard to roll out digital tools. The solution? Initiatives like solar-powered tech hubs or offline apps that don't rely on constant connectivity.

2. Training Teachers

Tech is only as good as the people using it. Teachers need proper training to integrate STEM tools into their classrooms effectively. When teachers feel confident using these tools, students benefit even more.

3. Cost Barriers

Even affordable tech can still be out of reach for some communities. That's where partnerships come in; governments, NGOs, and tech companies can work together to subsidize costs and distribute resources fairly.

Real Stories of STEM Making a Difference

These aren't just ideas, they're already happening:

1. The Hole in the Wall Experiment: In India, computers were installed in public spaces where kids from underprivileged backgrounds could access them. With no guidance, they figured out how to use the computers, explore educational content, and even teach themselves new skills.

2. Pratham's Digital Education: This NGO uses STEM tools to boost learning outcomes in underserved schools. Their programs have helped thousands of kids improve in subjects they once struggled with.

3. Bridge International Academies: Using tablets and STEM-based teaching techniques, this organization delivers affordable, quality education to students in Africa and Asia.

Why This Matters

STEM isn't just about technology, it's about empowerment. It gives underprivileged kids the tools they need to dream bigger and achieve more. At the same time, it challenges privileged students to think creatively and solve problems that matter.

By breaking down barriers and creating opportunities, STEM is turning education into what it should always have been: a powerful force for equality.

A Brighter Future

Imagine a world where every child, no matter where they're born, has access to quality education. STEM brings us closer to that vision. But it's not something we can achieve alone. Governments, schools, communities, and organizations need to work together to make it happen.

When we invest in STEM, we're investing in a future where every child has the chance to succeed. And isn't that the kind of world we all want to live in?

INR'S DEVALUATION AGAINST USD: GOOD OR BAD?

TANISHK DALAL

INTRODUCTION

The Indian Rupee has hit an all-time low of 1 USD = 84 INR as of October 4, 2024.

In the early 21st century, the USD was valued at just 42 INR, but, as visible from the graph, the value of the USD against the INR has been on the rise.

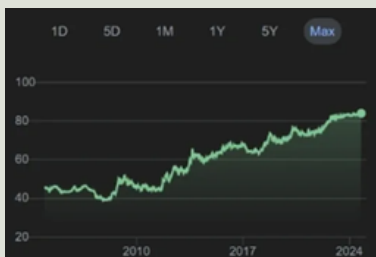
From 2005 to around 2008, the INR traded relatively stable between ₹40 and ₹50 per USD. This period reflects a phase where the Indian economy was experiencing significant growth and global confidence was relatively high. However, a dip can be observed from 2008 to 2009, which corresponds to the 2008 Global Financial Crisis.

This decline was partly due to global economic instability and capital outflows from emerging markets like India. Interestingly, during this time, the INR showed slight strength, a rare occurrence in the century, due to the major loss of investor confidence following the collapse of the U.S. housing market, which triggered a chain reaction of bankruptcies throughout the American economy.

Nevertheless, the strength observed in 2008 was not attributable to significant achievements within India itself. The real story of the Rupee's struggles began in 2011, influenced by government intervention. Between 2011 and 2017, the Indian Rupee experienced a gradual devaluation against the U.S. Dollar, largely due to India's economic liberalization, which had short-term negative effects on currency stability. For instance, in 2013, the government's efforts to curb inflation by raising interest rates adversely affected the value of the INR.

Moreover, India faced high inflation rates, particularly between 2011 and 2013, which eroded the purchasing power of the Rupee. Inflation, driven by rising fuel prices and food costs, rendered Indian goods less competitive globally, causing the INR to weaken further.

So, why did this happen? Let's quickly examine the interesting science of the economics behind this cause and consequence.



THE ECONOMICS BEHIND THE INFLATION

Imagine the Indian economy as a balancing act. On one side, you have money (INR), and on the other, you have the goods and services people buy. Inflation comes into play when there is too much money chasing too few goods—similar to too many people trying to buy too few tickets for a concert. Prices surge because businesses can charge more, and this was precisely what occurred in India between 2011 and 2013.

During that period, fuel prices skyrocketed, and food costs followed suit. As a major importer of oil, India saw its import bills balloon. When oil prices rise, everything becomes more expensive—transportation, food, manufacturing, and so on—because fuel is essential for nearly every stage of production and distribution.

When prices increase, inflation erodes the rupee's value. Your money buys less, meaning the purchasing power of the rupee diminishes. It's akin to trying to fill a shopping cart with the same budget you had a year ago, only to find you can barely afford the essentials.

This situation hurts India's international competitiveness, as Indian goods become more expensive on the global market. Consequently, foreign buyers may seek cheaper alternatives, reducing demand for Indian exports. Fewer exports lead to fewer dollars flowing into India, and with decreased demand for the INR from foreign trade, the currency weakens.

While the average person may view this as a negative trend and harbour resentment toward the government, it's important to recognize that this strategically managed currency devaluation can ultimately yield greater long-term benefits.

GOOD OLD OIL COMES INTO PLAY

As a net importer of oil, India's economy is highly sensitive to fluctuations in global oil prices. Between 2014 and 2016, rising crude oil prices significantly increased India's import bills, leading to a wider trade deficit—the difference between what the country exports and imports. Consequently, India had to spend more foreign currency (such as U.S. dollars) to pay for these imports, resulting in increased demand for dollars while the rupee weakened.

This chain reaction severely impacts the rupee: higher import bills elevate the outflow of foreign currency, and with fewer dollars coming in from exports or investments to balance the outflows, the rupee's value declines. Moreover, a larger trade deficit signals economic stress, prompting investors to perceive the rupee as riskier, which further contributes to its depreciation. This was a crucial factor in the rupee's decline during this period—a double blow to its value.

POST-2018, THE START OF A BRIGHTER CHAPTER

A weakening rupee means that exports become cheaper for foreign buyers, making Indian goods more attractive in international markets and thereby boosting export revenues. This strategy is known as competitive devaluation. By intentionally weakening its currency, a country can stimulate demand for its products abroad, which is especially important for developing economies like India. This approach helps protect domestic industries from global competition and creates jobs within the country.

DELHI'S BACKHANDED STRATEGY

As stated before, a weakening rupee, through competitive devaluation, makes exports cheaper for foreign buyers, boosting demand for Indian goods and protecting domestic industries, which is crucial for developing economies like India.

This impact is evident in the fiscal year 2018-19, when India's merchandise exports grew by 9.06%, reaching \$330.07 billion compared to \$303.53 billion in the previous year. This growth is directly linked to the competitive pricing advantage created by a weaker rupee.

Additionally, the IT sector benefited significantly, with software exports contributing to India's total export earnings. The depreciation of the rupee made Indian IT services more attractive globally, boosting exports by 8-10% in 2018-19.

Agricultural exports, including rice, spices, and tea, also saw an increase of around 7% during the 2018-19 fiscal year. A weaker rupee made these commodities more affordable in international markets.

THE OTHER SIDE

While the depreciation of the Indian Rupee has strategic advantages, such as boosting exports, it also carries several significant downsides, particularly given India's reliance on imports.

One of the most immediate consequences of a weaker rupee is the rise in import costs. India imports around 80% of its crude oil, and when the rupee weakens, the cost of these imports increases. This not only raises fuel prices but also impacts the prices of goods and services across the board, as transportation and production costs soar. Consequently, consumers end up paying higher prices for necessities, contributing to cost-push inflation, where the overall price level rises due to increased production costs.

From a trade balance perspective, a weaker rupee may not always result in a smaller trade deficit. While exports might benefit from increased competitiveness, India's heavy dependence on imports means that rising import costs may offset any gains made from increased exports. If export growth fails to keep pace with rising import costs, the trade deficit may widen, exacerbating economic pressures on the rupee. This creates a vicious cycle where a larger trade deficit further weakens the currency, making imports even more expensive.

HYDROPONICS: IS IT POSSIBLE FOR GROWING FOOD IN THE DARK?

DEBADITYA SEN

REVOLUTIONIZING FARMING WITH MINIMAL RESOURCES

For the longest time in the 21st century, people across the globe have been looking into the foreshadowing of Global warming. However, amidst this labyrinth of brainstorming solutions, some people have collectively wondered if farming with less water, less space, and little to-no soil was possible. Sounds quixotic, doesn't it? After all, how can the ever-growing population be fed under such circumstances? But take a step back for a moment, what if it is possible? A lot is yet to be discovered yet from what is unraveled; Hydroponics may be the answer for Nature's plea. However, a key insight to note is that Hydroponics is a vast topic with



some dedicating their whole careers to understanding this scientific genius, the following article will unravel the knicks of this method alongside the boon, bane and future Hydroponics; a method which may solve all our problems.

SECTION 01: WHAT IS HYDROPONICS?

Hydroponics, in short, is a method by which plants are grown without the collective usage of soil. Usage of other fibers however such as (rook wool or coconut coir) is used to provide support for the ingrown. The science behind this method was first discovered through English Scientist and philosopher Francis Bacon's (1561-1626) work: *Sylva Sylvarum* (1627) where-in experiments regarding water culture served as a groundwork for the development of this agricultural method. Today, the topic has outgrown into several techniques deeming fit for delivering certain nutrient rich water flowing constantly into the roots of the plant. One of these methods include the 'Nutrient Film technique' or (NFT), a method where-in a thin film of water rich in certain nutrients is pumped into the pipes. The pumping station pumps water every fifteen minutes and the excess water is released back into the main tank where the cycle continues.

Deep water Culture or (DWC) is another system where-in plant roots are suspended in a nutrient solution with an air pump providing oxygen which poses effective for fast-growing crops like lettuce in shorter spans of time. Additionally, methods such as Aeroponics (where-in plant roots are suspended in the air and misted with dilute nutrients) and the Wick system (systems involving nutrient transmission through absorption) are also other technologically advanced hydroponics tested and used based on their various characteristics.

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SECTION 02: BENEFITS OF HYDROPONICS

As mentioned in the previous section, different methods of implementing hydroponics provide different advantages. However, one benefit remains consistent throughout all the methods which is the reduced water usage to obtain crops; studies conducted by the National Aeronautics and Space Administration (NASA), has indicated that 90% less water is required in hydroponic systems which are present in all the methods. This was a part of NASA's research into sustainable food production methods for long-term space missions, where resource conservation is crucial.

However, that is not the only benefit it provides. In the current decade, with the harvesting of GMO's (Genetically modified organisms), availability of Organic food has become an increasing concern for the population. Even if they are available and consumed, health problems due to the regular use of pesticides are highly viable. Additionally, consistent usage of land for farming purposes voids the location of nutrients, stripping almost all the organically grown legumes of 50% of its nutritional factors. Hydroponics manages to resolve this issue alongside many more; due to its special property on growing on only water and other materials (i.e. coconut coir, rock wool etc.) vertical farming is the dominant method of executing these practices which also result in the dramatically reduced necessity of land allowing farming in Urban areas and areas void of water.

Not only does this method provide support for our current issues but it also supports natural processes such as Carbon sequestration helping us support nature in the billion-year-old carbon cycle also making us less dependent on conventional farming to feed the population with regular legumes. This would overtime heal farmland and agriculture for regional based vegetables can become more viable, increasing regional economic conditions. The Carbon footprint would drastically reduce in general due to their closer proximity to urban communities.

If this list of benefits were still not enough, the yield produced by the method of hydroponics are grown under 30-50% faster due to the environmental factors (i.e. pH, high oxygen exposure, light exposure and nutrient concentration.) Indicating just how beneficial hydroponic farming can be for our future generation.

SECTION 03: CHALLENGES AND LIMITATIONS

As Thomas Edison said, "Restlessness is discontent and discontent is the first necessity of progress.", Hydroponics and its future is still being researched upon (further discussed in Section 4) however, there are a few initial issues Hydroponic solutions may consist of. To begin with, high initial investment for setting up functions backgrounds for aeroponics and vertical farming which require multiple instruments such as water pumps, grow lights, climate control systems, and nutrient delivery mechanisms. Additionally, to avoid pests and speed up growth of the legumes, a greenhouse farming and exposure to certain wavelengths of light in the evenings may also take place which build up extra pricing. Moreover, hydroponics does reduce water intake but increases the need for energy thus other than wavelength usage; climate regulators to promote will be mandatory for specific methods and for areas receiving minimal light.

This not only adds to the pricing but may be a concern for areas which are mainly dependent on fossil fuel for sustaining electricity which may hinder the goal of hydroponics to create a more sustainable environment. Additionally, managing the nutrient balance, pH levels and regulating exposure to water requires technical knowledge which is often the barrier between regular farmers and the hydroponic realm, thus the new solution may be dependent on education for widespread usage. Another aspect to take into consideration is the regular maintenance; power outages may strike rapid death amidst growing plants (if renewable sources are not used), and if systems are not managed properly plastic waste from damaged pipes, containers, and even the grow bed can add to environmental degradation if further disposal is improper. However, in the end it is important to note that sustainable solutions are interlinked to several other factors and implementing hydroponics is not the answer for all our problems unless external direct and indirect factors linked to this method are taken care of.

SECTION 04: THE FUTURE OF HYDROPONICS

Further research on iterating solutions for issues (mentioned in section 03), by organizations such as NASA (the veggie project of ISS) and varied implementation of hydroponics are also taking place. For example, “True Garden” in the United States, a greenhouse vertical farm working towards developing legumes using this method. A reminder, it is important for other aspects of the world such as education and interconnectedness to enhance for Hydroponics to be completely effective as the solution is dependent on these factors and individual solutions may not be an effective answer for solving its limitations. Keeping that in mind, solutions to first handed problems such as monitoring softwares are being upgraded alongside which the usage of 3D printing as a replacement for damaged parts of mechanisms are being implemented, which reduces the efficacy of money.

Other than the creation of effective solutions, future hopes of creating skyscraper farms are also prominent; especially since Vertical farms can help enhance food security by reducing dependence on horizontal chain management, which are vulnerable to disruptions from climate change, pandemics, or soil erosion. Hydroponics also wishes to achieve the 2050 goal of feeding 9-billion people which traditional farming will not be able to achieve alone. Also, if successful, hybridization of the method into Aquaponics (a mutual beneficial cycle used between fish and the growth of plants for growing underwater legumes used as food).

Hydroponics, a ground-breaking discovery may just benefit us. Using the information decades of research has provided us may just save the world, generations from nutrient deficiencies and diseases. We are consuming space, why not benefit from it. We are splurging money on skyscrapers—why not for the ones which may benefit 9-billion people. We are able to share content with millions if not billions worldwide—why not educate the world about this innovation? Shift societies stereotype that farmers are illiterate. The decisions society takes today can change the world. What would you choose—Life of billions or minor bargains?

COSMIC PROSPECTS: NAVIGATING THE IMPACT OF ASTEROID MINING

RAAGHAV MODUKURI



Imagine a future where the vast, untapped resources of asteroids could revolutionise our economy and propel humanity into a new era of space exploration and sustainability. While it may sound unrealistic at first, this world is closer than imagined. How, you may ask? The answer is simple: asteroid mining.

Asteroid mining refers to the hypothetical extraction of materials from asteroids and other minor planets, including near-Earth objects. These celestial bodies, remnants from the early solar system, contain valuable metals like platinum, gold, and rare minerals, as well as water and other essential resources. The idea is to mine these materials either for use in space—such as fuel for spacecraft—or to bring them back to Earth for various purposes.

Although asteroid mining remains largely hypothetical due to its exorbitant costs, it holds immense potential. The development of asteroid mining technology could be a worthwhile endeavour, primarily because of the extremely valuable resources asteroids offer. For example, platinum and other precious metals in asteroids are far more concentrated than those found on Earth. This could lead to an economic windfall and support technological advancements.

In addition to the economic benefits, asteroid mining could have a significant environmental impact. Traditional mining on Earth depletes natural resources and damages ecosystems. By shifting mining operations to space, we could reduce the strain on Earth's environment. Furthermore, asteroid mining could contribute to clean energy initiatives, particularly through the creation of solar power satellites, which could provide a consistent source of renewable energy for Earth.

Another important factor to consider is the connection between asteroid mining and the history of the universe. Asteroids are considered remnants of the early solar system, having formed around 4.5 billion years ago. By analysing their composition, scientists can learn about the distribution of elements and minerals in the early solar system and the geochemical processes that occurred in the primordial solar nebula. Understanding these processes helps us better comprehend both the history of our solar system and its future potential.

This article will explore the various aspects of asteroid mining, focusing on its economic implications and its role in enhancing our understanding of the universe—both in terms of its past and its future possibilities.

(Read full article on our website)

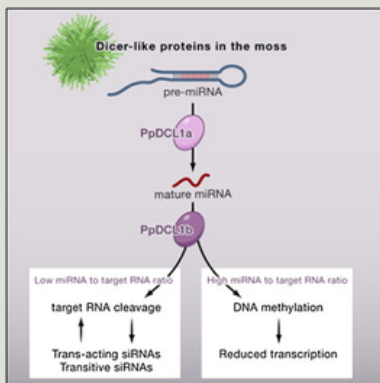
The Stem Review

UNRAVELING THE SECRETS OF GENE REGULATION.

DEBADITYA SEN

INTRODUCTION

Cancer, Type 1 diabetes, Alzheimer's, Parkinson's, Huntington's, and certain types of HIV—the diseases that have made the majority of the world and its residents miserable—are all tied to our genes and lifestyle. A fate that no one can change, right? What if that is not the case? Throughout the 21st century, scientists have persistently attempted to find a solution to genetic “fates,” whether hereditary or caused by environmental mutations. On October 7, 2024, Víctor Ambros and Gary Ruvkun were awarded the Nobel Peace Prize for discovering a major solution hidden within the genes of the human body—microscopic molecules termed MicroRNA. This discovery has the potential to save lives by the mere alteration of an atom.



Section 01: What is MicroRNA?

MicroRNA, also known as miRNAs, are nucleic acids—a type of organic compound made from smaller monomers called nucleotides. These biomolecules consist of a ribose sugar, a nitrogen base, and a phosphorus backbone. However, what separates them from most nucleic acids or RNA is their small size; they are made of only 22 nucleotides with a hook-like shape, whereas an average RNA molecule is composed of 500 to several thousand nucleotides.

Unlike regular RNA, which translates genetic codes or assists in protein production, miRNAs "silence" genes in a process called *gene regulation*. This process naturally supports metabolic activities, regulates responses to pathogens, and ensures that immune reactions are appropriately scaled. Their functions include suppressing cancer, heart disease, and other major conditions through the silencing of specific genes.

Section 02: The Role of MicroRNA in Gene Regulation

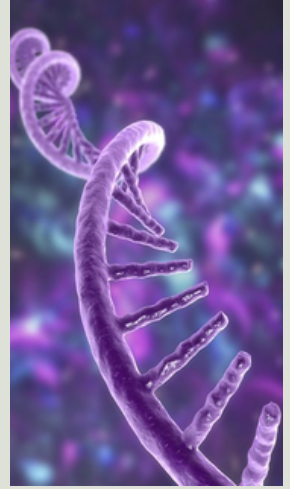
miRNAs perform their functions by binding to complementary sequences on messenger RNAs (mRNAs), forming a protein complex called the RNA-induced silencing complex (RISC). This binding either inhibits the mRNA's ability to translate proteins or degrades the mRNA entirely, depending on the extent of sequence compatibility. This ensures that specific genes are activated at the right time.

In the immune system, miRNAs help regulate inflammatory responses by silencing genes that promote excessive reactions. A single miRNA can influence multiple mRNAs, allowing for more precise and safer gene regulation. However, when miRNAs malfunction, they can cause severe consequences, such as cancer. This demonstrates the immense power these molecules hold over our lives and underscores their potential in limiting diseases through targeted therapies.

SECTION 03: POTENTIAL MEDICAL APPLICATIONS

In medicine, miRNAs offer several benefits. One notable application is in cancer treatment. miRNAs inhibit the overexpression of specific molecules, such as miR-21, to prevent tumor growth. They also aid in cancer detection through blood tests. Experimental drugs acting as miRNA mimics or inhibitors have shown significant promise in clinical trials for cancer treatments.

Beyond cancer, miRNAs hold potential in treating other genetic diseases, such as Type 1 diabetes, and in managing cardiovascular conditions. For instance, abnormal levels of miR-208 and miR-126 have been linked to heart failure, atherosclerosis, and other cardiovascular diseases. Similarly, miRNAs can be utilized in addressing neurological disorders like Alzheimer's disease. Perhaps the most significant feature of miRNA-based treatments is their ability to be personalized. Based on a patient's unique miRNA profile, doctors can tailor genetic and molecular therapies to meet individual needs, making genetic regulation a pragmatic solution for the future of medicine.



SECTION 04: CHALLENGES AND LIMITATIONS

Despite its promise, miRNA research faces several challenges. One major concern is its effect on mRNA. While miRNAs can regulate certain mRNAs beneficially, the human body's complex cellular network means that introducing external miRNAs or boosting the production of specific ones might disrupt other mRNAs, leading to unintended consequences such as impaired protein synthesis.

Furthermore, miRNA research, despite spanning decades, remains incomplete due to the complexity of these molecules. Delivering miRNA inhibitors or mimics is another obstacle, as the body's immune responses and enzymatic processes can degrade or misdirect these therapies. Ensuring that miRNAs reach their intended tissues without affecting other cells adds another layer of difficulty.

CONCLUSION

MicroRNA and gene regulation offer a glimpse into the immense potential science holds for addressing the so-called "fates" written in our genes. Though small, miRNAs can determine life and death by detecting and treating diseases and personalizing medicine to an unprecedented degree. However, much remains to be understood, and further research is crucial to overcome existing challenges.

As we advance in science, one thing is clear: If MicroRNA research continues to focus on treatment, the world may witness a new era of medicine. These tiny molecules have the potential to push the boundaries of science, redefining what we once thought were its limits.

BONUS ARTICLE BY THE TEEN STORIES



STEM and Mental Health: A Life-Changing Connection

Picture this: You're overwhelmed with school, life feels too fast-paced, and the pressures are piling up. Sounds familiar, right? Now, imagine having tools at your fingertips, tech tools, that not only help you manage your emotions but also make you feel heard and supported. That's where the magic of STEM (Science, Technology, Engineering, and Mathematics) meets mental health.

We've all heard how important mental health is. But for many, getting help isn't as easy as it should be. Therapy might feel intimidating, time-consuming, or even out of reach. Enter STEM; a game-changer in how we approach mental wellness. It's turning complex mental health challenges into manageable, everyday solutions. Let's explore how this unlikely pair, of mental health, and STEM is making a difference.

Why Mental Health is a Big Deal

Mental health is more than just being happy or sad; it's about how we think, feel, and deal with life's ups and downs. For teens especially, life can be overwhelming. Between school stress, social media pressures, and figuring out who they are, it's easy to feel lost or alone. The truth is, mental health struggles aren't rare. Millions of teens (and adults) face challenges like anxiety, depression, or burnout. Yet, talking about it openly or finding support still feels tough. That's where STEM tools come in making mental health help more accessible, relatable, and easy to use.

How STEM is Transforming Mental Health

Here's the cool part: STEM isn't just about robots or solving equations. It's about solving real problems. And mental health? That's as real as it gets.

1. Mental Health Apps: Your Pocket Therapist

Ever heard of apps like Calm, Headspace, or Wysa? These apps are like having a supportive buddy on your phone. They offer guided meditations, journaling prompts, and even AI chatbots to talk through your feelings.

- **Why this rocks:** You don't need to book an appointment or explain yourself to anyone. Apps provide quick, private help whenever you need it. For teens who aren't ready to open up to someone face-to-face, these are a lifesaver.

2. Virtual Reality: Facing Your Fears Safely

VR isn't just for gaming anymore; it's helping people tackle real fears. For example, if you're scared of public speaking, VR lets you practice in a virtual room full of people, but without the sweaty palms and judgment.

- **Why this rocks:** It's like training wheels for your brain. You can practice tough situations in a safe, controlled way until you're ready to take on the real thing.

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3. Wearables That Keep You in Check

Smartwatches and fitness trackers are stepping into the mental health game. They can track your stress levels, sleep patterns, and even your heart rate, giving you insights into how your body reacts to stress.

- **Why this rocks:** These devices are like little reminders to pause, breathe, or take a break. Over time, they help you understand what triggers stress and how to manage it better.

4. AI Tools: A Personal Guide to Mental Wellness

Artificial intelligence (AI) is making mental health care smarter. By analyzing your patterns, like how you talk or even your social media posts, AI tools can detect early signs of stress or anxiety.

- **Why this rocks:** It's like having a super-intuitive friend who notices when you're not feeling yourself and nudges you toward solutions that work for you.

How STEM Helps Teens Specifically

Teen life isn't easy; exams, peer pressure, and a whirlwind of emotions can feel like too much. But STEM tools are designed to help teens feel empowered rather than overwhelmed.

1. Interactive Journaling

Apps like Reflectly make journaling fun, guiding you with prompts to help make sense of your emotions. Think of it as a conversation with yourself, one that leaves you feeling lighter and more in control.

2. STEM Meets Self-Care

Activities like coding, building robots, or experimenting with science projects aren't just educational—they're therapeutic. Focusing on something creative and productive can lower stress and boost your confidence.

3. Online Communities

Platforms that connect teens with similar interests in STEM create a sense of belonging. When you're part of a group working on cool projects, it's hard to feel alone.

Smashing the Mental Health Stigma

One of the biggest hurdles in mental health? The stigma. People worry about being judged for admitting they're struggling. STEM is breaking that down in some incredible ways:

- **Anonymous Support:** With apps and online platforms, you don't have to tell anyone you're using them. It's just you and your phone, figuring things out at your own pace.
- **Learning Through Fun:** Gamified tools teach coping mechanisms without feeling like a chore. Imagine learning about stress management while playing a game, fun *and* helpful!
- **Reaching Everyone:** STEM makes mental health resources accessible even in remote areas. You don't need to live in a big city to get support.

Challenges to Watch Out For

Of course, it's not all smooth sailing. Bringing STEM and mental health together comes with some hurdles:

- **Tech Isn't Everywhere:** Not everyone has access to smartphones or the internet. Bridging this gap is crucial to ensure everyone benefits from these tools.
- **Human Connection Still Matters:** Apps and gadgets are great, but they can't replace talking to a real person. Finding the balance is key.
- **Privacy Concerns:** Sharing personal data with apps or devices means ensuring it stays safe. Developers must prioritize user privacy.

Why This Matters

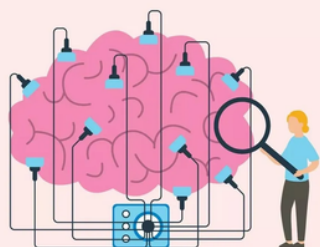
The partnership between STEM and mental health isn't just about cool gadgets or futuristic ideas. It's about people, helping them feel seen, supported, and understood. For teens, this means having tools that fit seamlessly into their lives, offering support without judgment.

Collaborations like the one between The Teen Stories and STEM Review are leading the charge. By combining mental health advocacy with STEM innovation, they're creating a future where support is just a tap or click away.

So, the next time life feels overwhelming, remember: there's a whole world of STEM-powered solutions designed to help you through. Because taking care of your mental health isn't just important; it's possible, and STEM is making sure of it.

THINKING BEYOND 10%: BREAKING DOWN THE MISCONCEPTION

AKSHAY SANDHYALA



Have you ever watched the movie “Lucy”? It’s a sci-fi 2010 film that’s based around what “using more than 10% of your brain” would look like, but how much of that idea holds true? How has this hoax affected modern media and pop culture? All of this and more as we dive deep into debunking the myth that has left minds incomplete for a while. The 10% brain theory is a myth that hypothesises that human brains are utilised only to a certain capacity, 10%.

It also suggests how finding ways to access more than 10% of the brain can grant telepathic abilities like telepathy, telekinesis, and superhuman intelligence. These ideas have been perpetuated in famous media and pop culture, like movies such as Lucy, because what doesn’t make a better sci-fi plot than this. The myth has been proven, on numerous occasions to be false, yet is still exploited and believed, but how did it get its start?

ORIGINS

To preface, let’s establish a proper answer, before the explanation and conclusion. The short answer to if this myth is true: no. The 10% of your brain myth has a perplexing history, often misinterpreted. It is believed that the notion started in psychologist William James’ book “The Energies of Men” that “We are making use of only a small part of our possible mental and physical resources.” This simple sentence lit the candle that humans utilise a certain (small) portion of our Brain and gave birth to the myth.

THE EARLY MISINTERPRETATIONS

Many minute details and early works might have contributed to the myth. For example, Karl Lashley’s work between the ‘20s and ‘30s showed how animals like rats could still function and relearn tasks even with major parts of their cerebral cortex removed. French physiologist Pierre Flourens conducted major work in the functions of the brain in vertebrates. His conclusions agreed that “the brain acts only as a functional entity although specific functions are controlled by specific parts of the brain.” This theory could have been misrepresented throughout the ages, to not show how interconnected parts of the brain are, isolating individual parts to individual functions perpetuates ideas of non-utility. Flourens also conducted experiments to show how animals can still function without parts of their brain, much like Lashley, which also fanned the flames for the myth. It could even be that many people collectively agreed about this myth and that further popularised the myth, or even how it paints a more symbolic picture of how incomplete humans are. Einstein wouldn’t lie, right? - Many people claim that Einstein has quoted and acclaimed much of his cognitive success to utilising more of his brain than normal humans would. However, there is no accurate source for this quote and claim.

MODERN NEUROSCIENCE

THE PAST IS THE PAST

Modern technology has come a long way, and one of the most prevalent fields that has experienced this evolution is neuroscience, which has only assisted in the battle to debunk the 10% myth. Imaging devices like MRIs and PETs, revealed a clear window into the brain, and gave us a lot of evidence that contradicts the myth.

EYE SPY WITH MY LITTLE MRI

Magnetic Resonance Imaging, or MRI for short is an imaging technique used in the medical field to generate radio waves through a magnetic field that provides images of tissues and organs in the human body. Essentially, they are gigantic magnets that help create images of anything and everything inside you. MRIs have been a huge help in debunking the 10% myth, fMRI scans have discovered how the cerebellum (a certain part of the brain related to motor) had a surprising response to stimuli not attributed to motor, showing how brain functions are interconnected, and diverse. These discoveries “motivated a reconsideration of the traditional model of cerebellar organisation and function.”



TEAMWORK MAKES THE DREAM WORK

Many studies conducted suggest how the brain is not a one-man army. Many parts of the brain work together to facilitate functions. Like, as previously mentioned, the cerebellum is associated with motor skills, but recent studies show that it is of use in many other areas of the brain like behaviour and perception. In a review on large scale brain networks and functional areas like Default Mode Networks (DNMs) which include the medial prefrontal cortex, an area of interconnectedness in the brain. These studies are cohesive enough to deduce that interdependence is a major factor in normal brain function and that many parts of the brain are utilised at many times, further breaking down the myth.

COGNITIVE SUPERPOWER

SMALL BUT STRONG

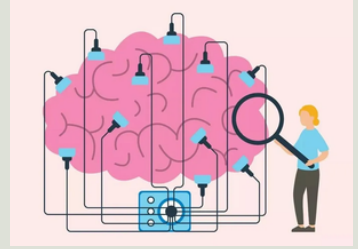
The brain is relatively small compared to your entire body, as it only accounts for 2% of total body weight, but don't let its size fool you; the brain is responsible for almost 20% of the body's total energy consumption. Even during resting states, the brain is one of the most intensive organs in the body. The brain is shown to have nearly 86 billion neurons in its entire structure, with each one of them constantly firing impulses to communicate and help the body function. Such power and consistent use of it goes to show how it's almost far fetched as to how it can only be utilised up to 10%.

SURVIVAL OF THE FITTEST

Now shining an evolutionary glass towards the subject in hand, if the brain is only capable of being utilised to 10% of the maximum amount, why do we have so much of it? The brain is energy demanding, and so, the maximum capacity being only 10% will not be energy efficient, and evolution loves efficiency. If we could only use 0% of such a large brain, what's the point of the rest, and how have humans developed such a complex structure and towered above every other organism? Darwinian principles highlight how only the fittest may survive, yet the 10% myth contradicts and says humans have one of the most under-utilised features of the most important and central organ.

NEURAL PLASTICITY

Neural plasticity is a unique concept associated with the brain. It is a process that the brain undergoes that includes structural and functional changes, in order to respond to stimuli and change. Neural plasticity is typically due to any damage done to the brain such as a stroke, or TBI (Traumatic Brain Injury). Neural mechanisms like regeneration and reorganisation utilise various parts of the brain and secondary brain networks



to operate. This complex and intricate procedure is a testimony to how the brain utilises a plethora of areas to function properly even when that is the main issue, functioning properly. The 10% myth isn't feasible, even when the brain experiences damage.

POP CULTURE

FAKE IT TILL YOU MAKE IT

Pop culture has been a major outsource for the continuation of this myth, even with modern research and learnings. Why would boring blank pages on pages of jargon be more appealing and sway audiences rather than a movie about telepathy? "Pop Culture," exploits and abuses myths to get what matters the most, money. Movies such as Lucy emphasise superhuman abilities and the untapped potential that exists by accessing more than 10% of the brain.

INCOMPLETE COMPLETION

Past all the basic and understandable reasons for this myth, there is an underlying reason that symbolises a much deeper meaning to the concept. The idea that no matter how successful the human race is, there is always something more, right? Beyond our cerebral marvels, the idea that there is still 90% more to conquer is thought provoking, an astounding ordeal that prompts the sense of wonder and exploration, the strive to continue to discover things beyond a capacity that is set as the limit. This appeals to people that there still is a long way to go, a journey that discovers the true capabilities of the human body, and how they might be a part of it.

CONCLUSION

WE DON'T NEED IT TO BE HIDDEN

The brain is a biological marvel, an iconographic symbol of knowledge, wisdom, complexity, thoughts, emotions and more. The brain is a fundamental statue embedded in us that embraces the idea of what makes everything that breathes around us so special. We don't need to isolate ourselves into the thought that we are limited; instead we should prioritise embracing how the brain is an amazing gift given to us that allows us to go above every other organism and achieve what humanity has.

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BONUS ARTICLE BY KRITIVATAN ORGANISATION



The use Of AI and agricultural drones is revolutionizing modern farming. creating opportunities to optimize practices. increase yields, and make food production more efficient and sustainable. When applied to ensuring food availability for the underprivileged. these technologies can play a crucial role in addressing food security issues. Here's how they can be utilized:

Precision Agriculture with AI

AI-driven precision agriculture uses advanced algorithms to analyse data collected from various sources, including satellites, drones, and sensors in the field. These technologies help farmers make data-driven decisions, such as:

- **Optimizing Water use:** AI algorithms analyse weather data, soil moisture levels, and crop needs to precisely control irrigation. This reduces water wastage and ensures crops receive the right amount of water, even in areas facing water scarcity.
- **Fertilizer and Pesticide Management:** AI can predict when and where crops need fertilizers or protection from pests, reducing the overuse of chemicals. This leads to more efficient use of resources and healthier crops, which in turn can reduce food loss and improve yields.
- **Crop Monitoring and Disease Detection:** AI can identify early signs of crop diseases nutrient deficiencies by analysing images captured by drones or sensors. Early intervention minimizes crop loss, ensuring better harvests.
- **Yield prediction:** AI models predict crop yields based on various parameters (weather, soil health, pest threats, etc.), allowing farmers to prepare better for harvest and manage resources more efficiently.

DRONES IN AGRICULTURE

Drones are increasingly being used in agriculture for tasks like surveying fields, monitoring crop health, and delivering precise amounts of water, nutrients, or pesticides. Key uses include:

- **Field Mapping and Monitoring:** Drones equipped with high-resolution cameras and multispectral sensors can create detailed maps of fields. These maps help farmers spot problem areas like pests, diseases, or irrigation issues. Early intervention prevents larger losses and ensures a higher quality of produce.
- **Efficient Spraying and Fertilizing:** Drones can be used to spray pesticides or fertilizers in a more targeted manner, reducing the waste of chemicals and ensuring more precise application. This not only saves money but also helps preserve the environment and reduces the impact on underprivileged communities living nearby

- **Soil Health Assessment:** Drones equipped with soil sensors can provide real-time data on soil conditions, helping farmers make informed decisions about irrigation and fertilization. Healthier soil means better crop growth, leading to more food production.
- **Harvesting Optimization** Some advanced drones can also help with monitoring crop maturity, guiding farmers on the optimal time for harvesting to maximize yields and reduce losses.

Reducing the gap in food accessibility

AI and drones can help make food production more accessible to underprivileged communities by:

- **Small-Scale Farmers Empowerment:** With the decreasing cost of drone technology AI tools, even smallholder farmers can benefit. These tools can increase their crop yields, reduce costs, and improve market access, thereby enhancing their financial stability.
- **Cost-Effective Solutions:** AI and drones provide low-cost solutions to issues like water scarcity, soil degradation, and crop pests. As these technologies become more affordable, they can help farmers in developing countries increase food production with fewer resources.
- **Targeted Food Aid:** AI can analyse food scarcity patterns and where underprivileged communities might face food shortages. Drones can then be used for efficient distribution of resources, such as delivering emergency food supplies to hard-to-reach areas-ex: America dropping parachutes to people in need for in Palestine.

Sustainability and environmental impacts

One of the key challenges in ensuring food availability for all, especially the underprivileged, is balancing production with sustainability. AI and drones contribute to more sustainable farming practices:

- **Reduced Environmental Impact:** By reducing the need for excessive water, fertilizers, and pesticides, AI and drones contribute to more sustainable farming practices that protect ecosystems and local communities. This is particularly important for maintaining biodiversity and reducing the environmental footprint of agriculture.
- **Climate Change Adaptation:** AI can help farmers adapt to the impacts of climate change by providing weather forecasts, analysing long-term climate trends, and recommending adaptive farming practices. Drones can also help monitor environmental changes, ensuring that farming practices remain viable even in shifting conditions.

Education and training opportunities

AI-driven platforms and drone-based technologies can help train farmers in underprivileged

- **Skill Development:** Farmers can learn how to use AI and drones effectively through online courses or mobile apps, enabling them to boost productivity and adopt best practices.
- **Collaborative Platforms:** AI-powered apps can advice to farmers in remote regions, helping them stay connected with agricultural experts, These platforms can guide farmers on pest control, Crop rotation, and sustainable farming techniques.

What's in it for the farmers?

In India, farmers often face economic struggles and lack recognition for their crucial role in feeding the nation. This has led to fewer young people pursuing farming, viewing it as a low-paying, labour-intensive job with limited prospects. However, the integration of AI in agriculture could change this narrative significantly “AI is the seed of a new era in farming – growing, innovation, productivity and recognition for the hands that feeds us”.

Conclusion

AI and agricultural drones hold immense potential to optimize farming practices, increase yields, and improve food security, especially for underprivileged communities. By enabling more precise, efficient, and sustainable farming methods, these technologies can help ensure that food production meets the needs of growing populations while minimizing environmental impact. The key is making these technologies affordable and accessible to smallholder farmers and communities in need, which can ultimately create a more equitable and md-secure future.