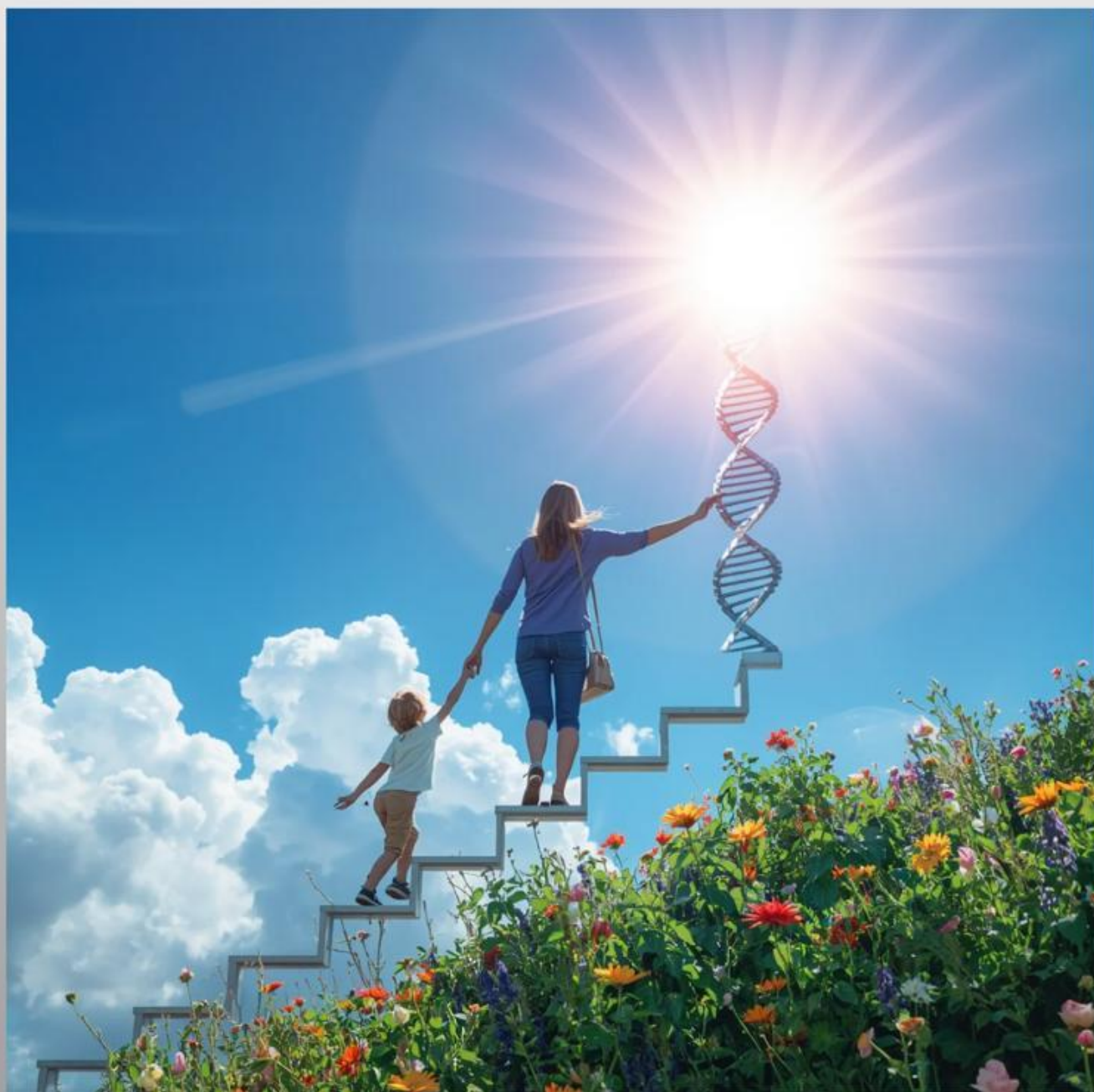


An Official Magazine of Faculty of Health and Life Sciences

Student's Chronicles



Mahayogi Gorakhnath University Gorakhpur

Arogyadham, Balapar Road, Sonbarsa, Gorakhpur-273007, UP , India

STUDENT'S CHRONICLES

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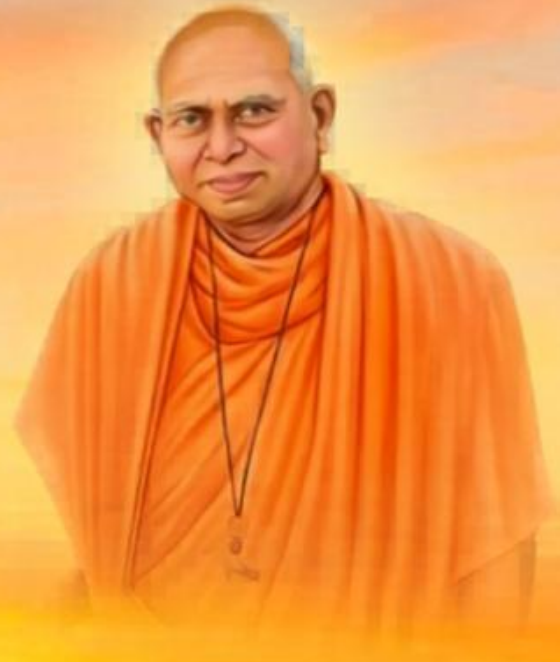
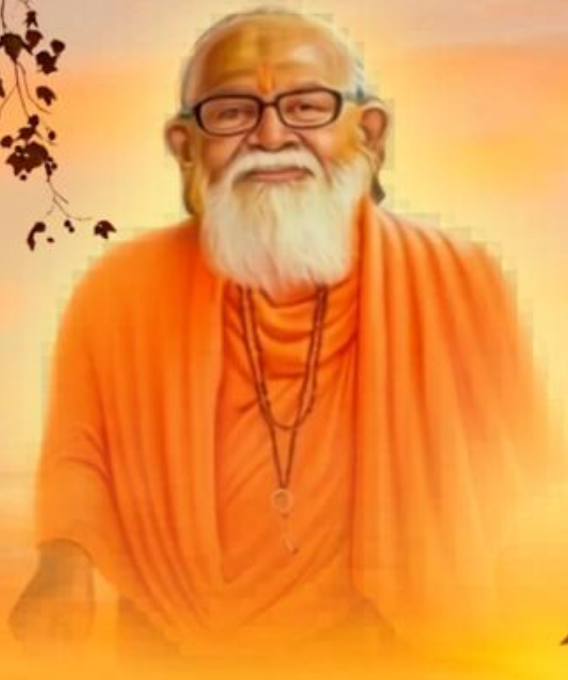
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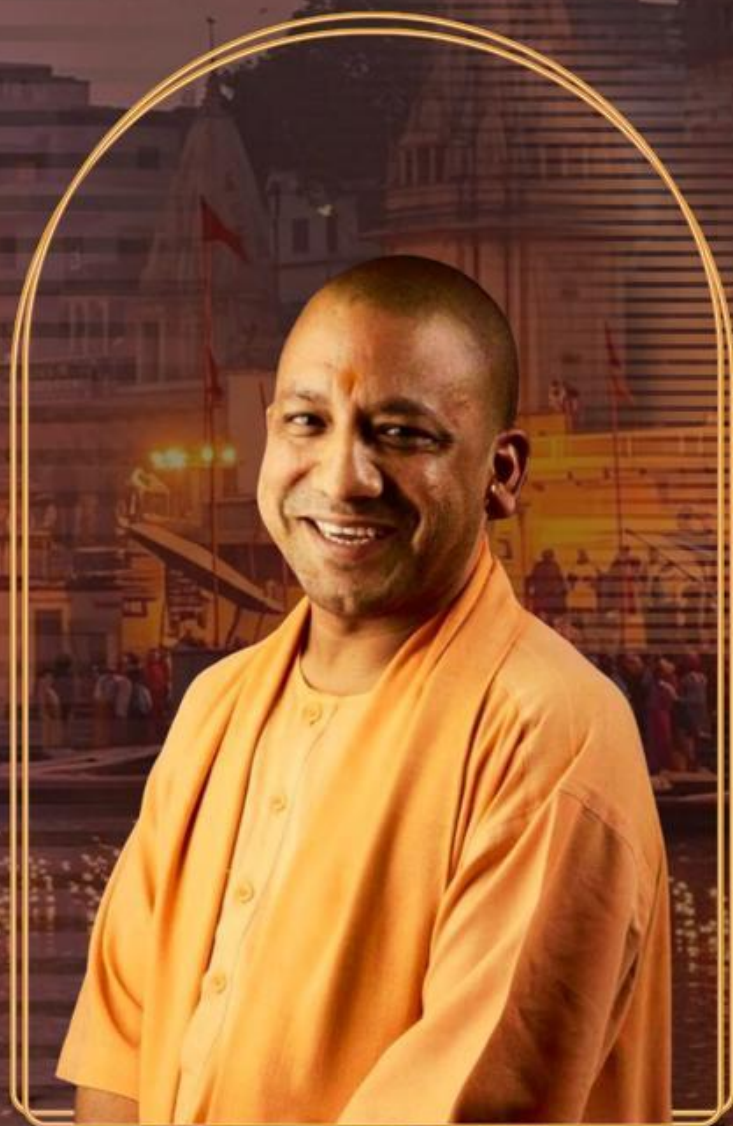
हमारे आराध्य



Our Inspiration



Inspirational Leadership



Shri Yogi Adityanath Ji Maharaj

Hon'ble Chief Minister, Government of Uttar Pradesh

&

Chancellor, Mahayogi Gorakhnath University

Gorakhpur

Our Mentors



Dr. Surinder Singh
Vice Chancellor, MGUG



Dr. Pradeep Kumar Rao
Registrar, MGUG



Dr. Sunil Kumar Singh
Dean, Faculty of Health
and Life Sciences



Dr. Manish Kumar Tripathi
Principle, Maharana Pratap PG
College, Jungle Dhushan, Gkp



Message From The Dean

*The strength of any leading academic institution lies in the vitality and courage of its students' voices. The arrival of the third edition of **Student's Chronicles Magazine** stands as a vibrant proof of that vitality here at the Faculty of Health and Life Sciences. It serves as a reminder that while we deal in facts and figures, the heart of science is driven by human curiosity and the passion to make a difference.*

In this edition, we see our students stepping into their roles as emerging thought leaders. The diverse range of topics spanning from technical research summaries to creative reflections showcases the multifaceted talent within our university. In a world increasingly driven by rapid scientific advancement, the ability to engage in "academic storytelling" is what sets our graduates apart. You are not just learning the science; you are learning how to lead the conversation around it.

I am particularly impressed by the editorial team's ability to sustain this momentum. Transitioning from a debut launch to a consistent third volume requires immense discipline and vision. I commend the contributors for their scholarly contributions and the editorial board for their tireless efforts in curation and design.

I would like to extend my heartfelt congratulations to the editorial team for their initiative and for providing a platform that nurtures scientific temperament alongside artistic flair. Your commitment to excellence is what makes this publication a beacon of student creativity.

*I invite the readers to immerse themselves in these pages. Let the ideas presented here spark new debates in our corridors and inspire fresh hypotheses in our laboratories. To the contributors and editors, thank you for your dedication to the scholarly spirit of **Mahayogi Gorakhnath University Gorakhpur**. I look forward to seeing this magazine grow into an even more influential voice in the years to come.*

Prof. Sunil Kumar Singh

Dean

Faculty of Health and Life Sciences
Mahayogi Gorakhnath University Gorakhpur

Message From Editor Desk

It is with a profound sense of accomplishment that we present **Volume 3** of the *Student's Chronicle Magazine*. If our journey began as a simple collection of ideas, this edition is the wave of a powerful testament to how scientific inquiry and creative expression converge at the **Faculty of Health and Life Sciences**.

Our deepest gratitude goes to our Dean, **Prof. Sunil Kumar Singh**. Thank you, Sir, for providing the platform and the belief that education extends far beyond the classroom. Your vision remains our North Star, inspiring us to strive for a higher standard with every volume.

We also owe a heartfelt thank you to our Mentor, **Dr. Manish Kumar Tripathi**, for being the steady hand behind this project. Whether refining a technical section or providing a necessary nudge when our energy flagged, your practical wisdom and genuine care kept this ambitious edition on track.

We are honoured to feature a standout contribution from **Dr. Amit Kumar Dubey**, whose insights provide a cornerstone for this edition. To our **Incredible Contributors**, thank you for turning these pages into a rich tapestry of intellect. From rigorous reviews on *foundation of antibodies* and the *Radiotrophic extremophiles* to the *Role of AI in medicine*, your research pushes our boundaries. We are equally grateful for the wonderful “Poetries” and “Free Writings” that bring a soulful, human touch to our scientific discourse.

A special shout-out to our incredible **Editorial Team members**, this magazine is the result of your late nights and tireless effort. You have been the architects of every layout, ensuring every story finds its clearest voice.

Finally, to our Readers this magazine was made for you. We invite you to immerse yourselves in these diverse voices and discover the unique Surprise Pages hidden within. May the research and stories inside ignite your own spark of curiosity and a commitment to positive change.

Thank You for being part of our journey.

Editorial Team *Student's Chronicle Magazine*

Student's Chronicle: A Magazine of Faculty of Health and Life Sciences

Student's Chronicle Magazine is an initiative of the faculty of health and life sciences of Mahayogi Gorakhnath University Gorakhpur. It is a quarterly magazine that contains general/scientific articles, poetry, stories, general awareness content, and social wellness-related content. The whole content of this magazine is supposed to be produced or developed by the student of the Faculty of Health and Life Sciences. The idea behind this initiative is to provide a platform for content development beyond the university curriculum for the student. Apart from this, students will also get knowledge of the publishing process of articles by getting hands-on with Microsoft Office and different tools of computer applications that play a key role during the publishing process. It will also develop a culture of teamwork and leadership quality among those who will work as part of the core team of this magazine.

Guidelines and rules for the contents of the magazine-

1. Every contribution to this magazine should be **original** and **self-created**.
2. Initially, the total number of pages in this magazine is 14, excluding editorial details, front, and back pages.
3. Only a single contribution is allowed for an individual.
4. The **800 maximum words** and **one image** are allowed in a single contribution.
5. Only self generated images are allowed to avoid copyright issues.
6. The final decision on contribution will be taken by the core editorial committee of this magazine.
7. In the core editorial committee of this magazine, there will be **six editors**, including 1 principal editor (reserved for post-graduation students), 1 editor (reserved for post-graduation students), and 4 co-editors (reserved for undergraduate students).
8. One faculty member will also work with the core committee for the students who were assigned by the Dean of the Faculty of Health and Life Sciences.
9. The language of contribution is either **Hindi or English or Sanskrit**.
10. The magazine's non-printable version is released in the upcoming **quarter month**, submission must be received one month prior to release to qualify for the current edition; otherwise, they will be slated for the next. The students will send their contribution via email (studentschronicle05@gmail.com) by the **30th of every quarter**.
11. Magazine should have contribution from the following areas-
 - a) General topics related to health and disease
 - b) Value-added stories, prose, and poetry
 - c) Indian culture and heritage
 - d) General science and technology
 - e) Any other topics relevant to humanity and nature

Note: Authors are responsible for their contents.

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Dr. Amit Kumar Dubey	HOD of Biotechnology Department



माँ

रुचि शुक्ला
बी.एससी. बायोटेक्नोलॉजी,
पूर्व छात्रा (बैच 2024-2025)

महसूस ही नहीं हुआ
कब हम बड़े हो गए
कब छोटी-छोटी बातों पर रोने वाले
अब चुप रहना सीख गए।

कब अपनी पसंद छोड़कर
सबकी पसंद जीने लगे।

और कब
हम धीरे-धीरे
अपनी माँ जैसे होने लगे।

वही सहना,
वही चुप रहना,
वही हर दर्द को
मुस्कान में छुपा लेना।

अब समझ आता है
माँ थकती भी थी
पर कभी जताती नहीं थी।

आज हम भी वैसे ही हो गए हैं,
सब ठीक है कह देते हैं,
शायद हम सच में,
अपनी माँ जैसे हो रहे हैं।।

गाँव की सुबह

छाया
बी.एससी. बायोटेक्नोलॉजी, प्रथम वर्ष

गाँव की वो सुबह बहुत याद आती है,
सूरज की नर्म किरणें दिल को छू जाती हैं।

मिट्टी की वो भीनी-भीनी सुगंध,
आज भी यादों में महका जाती है।

माँ की वो प्यारी सी सुबह की आवाज़,
जिसमें बसी होती थी एक मीठी सी बात।
उनकी मुस्कान के पीछे छुपा वो प्यार,
बना देता था हर दिन को खास।

काश फिर वैसी सुबह लौट आए,
जहाँ हम बचपन की गलियों में खो जाएँ।
ना कोई शोर, ना दुनिया की दौड़,
सिर्फ माँ का प्यार और गाँव का सुकून हो।

कहाँ खो गए वो सीधे-सादे दिन,
जहाँ हर रिश्ता लगता था अपना ही।
आज की इस समझदारी भरी दुनिया में,
ना वो अपनापन, ना वो बात रही।

आज भी दिल बस इतना ही कहता है-
याद आती है वो गाँव की सुबह।।



पतंग और उसकी डोर

आकृति
बी.एससी. बायोटेक्नोलॉजी, प्रथम वर्ष

खुले आसमान में उड़ती हुई पतंग हर किसी का ध्यान खींच लेती है। वह हवा की दिशा में ऐसे लहराती है, जैसे पूरी तरह आज़ाद हो। लेकिन उसकी असली ताकत उस पतली सी डोर में होती है, जो उसे थामे रखती है। बिना डोर के, पतंग कुछ देर उड़ती है, फिर भटककर गिर जाती है।

खेल का मैदान भी ऐसा ही होता है। जब कोई खिलाड़ी शानदार प्रदर्शन करता है, तो हम उसकी जीत और आत्मविश्वास देखते हैं। लेकिन उसके पीछे छिपी मेहनत, अभ्यास और अनुशासन की डोर को अक्सर अनदेखा कर देते हैं।

हर मैच सिर्फ स्कोर का खेल नहीं होता। खिलाड़ी अपने डर, दबाव और असफलताओं से भी लड़ता है। कई बार वह टूटता है, लेकिन फिर भी उठकर आगे बढ़ता है, क्योंकि वह जानता है कि यही संघर्ष उसकी असली ताकत है।

कभी-कभी यह डोर बोझ लगती है — सख्त नियम, लगातार मेहनत और बार-बार की असफलताएँ। लेकिन यही डोर हमें गिरने से बचाती है और आगे बढ़ने की ताकत देती है। जैसे पतंग को ऊँचा उड़ने के लिए डोर का खिंचाव जरूरी होता है, वैसे ही खिलाड़ी को आगे बढ़ने के लिए संघर्ष जरूरी होता है।

आखिर में, जीत ट्रॉफी से नहीं मापी जाती...
बल्कि उस हिम्मत से मापी जाती है,
जो हर हार के बाद भी हमें फिर से खड़ा कर देती है।
क्योंकि पतंग तभी तक उड़ती है,
जब तक उसकी डोर टूटती नहीं।

सकारात्मकता अपनाओ, अवसाद को दूर भगाओ

स्वस्तिक मिश्रा
बी.एससी. बायोटेक्नोलॉजी, द्वितीय वर्ष

जीवन में थोड़ा उत्साह लाना बहुत जरूरी है। चाहे गाना हो, नाचना हो, पेंटिंग करना हो या कुछ नया सीखना—बस शुरुआत कर दो। शुरू में मन न भी लगे तो भी खुद को रोकना नहीं चाहिए। धीरे-धीरे यही छोटी-छोटी कोशिशें आपके सोचने के तरीके को बदल देती हैं और मन को हल्का महसूस कराती हैं।

हर इंसान कभी न कभी उदासी या अवसाद जैसा महसूस करता है। कई बार यह हल्का होता है और थोड़ी मेहनत से ठीक भी हो जाता है—जैसे टहलना, किताब पढ़ना, दोस्तों से बात करना या अपना मन पसंद काम करना। लेकिन अगर यह लंबे समय तक बना रहे, तो इसे नजरअंदाज नहीं करना चाहिए।

अवसाद के पीछे शारीरिक कारण भी हो सकते हैं, जैसे थकान, नींद की कमी या शरीर की कमजोरी। ऐसे में आराम करना, सही खाना और हल्का व्यायाम बहुत मदद करता है।

साथ ही, हमें खुद को समझना भी जरूरी है। यह सोचना चाहिए कि आखिर हमें उदासी क्यों हो रही है। कई बार असफलता, किसी अपने को खोना या रिश्तों की परेशानी हमें अंदर से तोड़ देती है। ऐसे समय में भागने की बजाय हिम्मत से सामना करना ज्यादा जरूरी होता है।

अगर असफलता की वजह से मन टूट गया है, तो इसे अंत नहीं समझना चाहिए। बल्कि इसे एक नई शुरुआत की तरह लेना चाहिए। छोटे-छोटे कदम उठाकर आगे बढ़ना चाहिए, क्योंकि हर कोशिश हमें मजबूत बनाती है।

सबसे जरूरी बात—अपने आप पर भरोसा रखो। दूसरों से उम्मीद कम और खुद से ज्यादा रखो। अपनी भावनाओं को समझो और उन्हें सही दिशा दो। धीरे-धीरे आप खुद महसूस करोगे कि आप पहले से ज्यादा मजबूत और सकारात्मक बन चुके हो।

A Silent Fight

Anushka Dwivedi
B.Sc. Biotechnology, 3rd Year

People say, we should chase....

The life we want to have, the success we wish to achieve, a life that gives indication of who we are.

And we do.

We hustle,

With deadlines and expectations hanging over top of our heads, ambition inside us pushing us to do

More, telling us- “you have more potential.”

While in the moments of being quiet, there is also a part of us asking

Softer Gentler-

“Are you enjoying?”

Ambition is very loud.

It pushes, it encourages, it judges, it expects more of you.

It creates to-do lists called ‘your life.’

Happiness, on the other hand, is very quiet.

It can be found in small quantities-

The laughter you share, the pauses you have, and simply in your existence.

We are lead to believe

That you cannot experience both at once...

We are told that in order for us to achieve our goals,

We must sacrifice our joy.

We must...

However, what if that’s a false statement?

What if you are truly trying to achieve your goals?

To allow yourself the gift of experiencing ‘happiness’ in addition to ‘success’?

What if you could experience both during your journey to success and then also after achieving Your goal?

Because the ‘success’ (ambition) you create a life on may appear fulfilled but really doesn’t feel Fulfilled.

Similarly, the ‘comfort’ (happiness) you create a life on may be easy to create a comfortable life, but

Really does not equate to finishing your journey.

So let’s try not to choose one or the other

But rather find a way to experience both creating the life that you dream of, without losing yourself Along the way.

Failure is the First Step of Success

Anushka Srivastav
Medical microbiology, 3rd year

Failure is not opposite success, it's part of success. Failure is not first step toward success correction of your mistakes after failure is a first step toward success.

Do you also think same? if yes then good. Failure teaches us many moral values that one should never give up, sitting sadly and go in depression. In spite of doing such thing we should come with more hope more, ambitious more hard work, more stalwart and endless positiveness.

Failure is that word by which each and every individual gets scared. They don't know that our failure teaches us so many lessons.

You might know the theory of relativity and photoelectric effect which was introduced to us by one and only the great scientist Albert Einstein and you will get surprised by hearing that he is also included in list of famous failures. Many more failures like J.k Rowling, Abraham Lincoln, Abdul Kalam, Albert Einstein and etc. Who inspired us that there will be more and more obstacles in the way of our success the only thing we have to do is never be hope less and do hard work to overcome all difficulties in our life.

Content: "Failure is not the end of life, but a step towards success. It teaches us important lesson and helped us improve. Many great people J.K Rowling and Abraham Lincoln failed many time before becoming successful. Failure makes us stronger and more confident. we should not be afraid of failure but learn from it and keep trying. Hard work and determinate always lead to success.

Success is rarely a straight line, and the "first step" is defined not by the fall, but by the choice to get up and apply the lesson.

The merits: of this topic are Failure acts as a powerful teacher that revels of hidden qualities. The demerits: of this topic are, it can be cause discouragement, and loss of motivation, shame, etc. If not properly realized or repeating the same mistakes.

Trying new things, taking risks, and lack of initial experience, which force individuals to step out of their comfort zone.

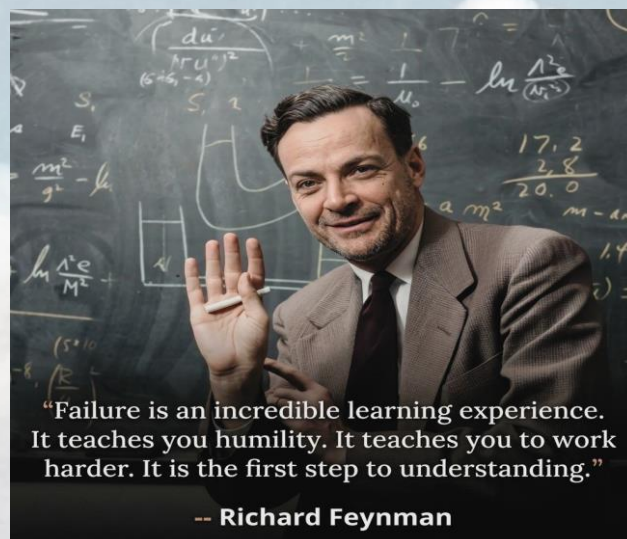
Immediate pain, frustration, and humiliation, which act as crucial feedback, forcing self-reflection, building resilience, and fostering humility. The acquisition of priceless lessons and experience, leading to improved strategies, a growth mindset, and ultimately, a more solid and enduring success.

You Never Fail Until You Stop Trying

Positive Point: Teaches valuable lessons that success cannot.

Negative Point: Fear can reduce confidence, create fear of trying again, and cause stress and negative thinking.

Conclusion: Trying and failing is better than never trying at all, as failures are simply opportunities to start again more intelligence.



The Journey of Self Growth in a Competitive World

Disha Mani Tripathi
B.Sc. Biotechnology, 1st Year

Nowadays, life is very competitive, and everyone wants to succeed. In this situation, personal growth becomes very important for every student. It is not only about success in studies or career, but also about becoming a better person. Self-development is a continuous process that helps us improve our thinking, skills, and personality.

Personal growth starts with self-awareness. When we understand our strengths and weaknesses, we can improve ourselves. Many people fail not because they are not talented, but because they are not clear about their goals. When we know what we want, we can take the right steps. I realized that I was weak in time management, so I started working on it.

Discipline is one of the most important parts of self-development. Motivation helps us start, but discipline helps us continue. For example, waking up early, following a routine, and staying consistent can bring big changes over time. Success does not come in one day; it comes from daily effort.

Learning is also very important. Today, we can learn many things from the internet, books, and online platforms. A person who keeps learning always grows. Learning new skills increases confidence and gives new opportunities. Students can learn many useful skills from YouTube and other platforms in their free time.

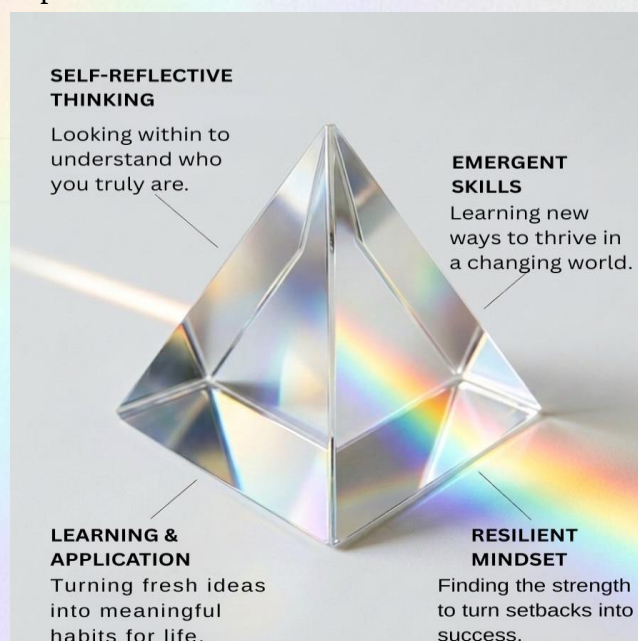
Self-growth also means stepping out of our comfort zone. Many people avoid challenges because they fear failure. But failure is not bad. It teaches us important lessons and helps us grow. Every failure makes us stronger. Trying new things helps us understand our true potential.

Time management is very important in personal growth. Many students waste time on mobile phones or social media. If we use our time properly, we can achieve more. Planning our day, setting priorities, and avoiding distractions are good habits.

I also try to reduce my mobile usage and focus more on my studies. Mental health is also very important. A positive mindset helps us face problems and stress. Doing meditation, staying active, and being with positive people can improve our mental health.

Lastly, self-growth is a journey, not a destination. There is always something new to learn. We should not compare ourselves with others. Instead, we should try to become better than yesterday. Small daily improvements bring big results in the future.

In conclusion, personal growth is very important for a successful life. With discipline, continuous learning, good time management, and a positive mindset, anyone can achieve their goals. The journey may be difficult, but with effort, success is possible.



From Heavy Volumes to High-Speed Insights: How AI Is Redefining the MBBS Journey

Yashi Singh
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Introduction

The life of an MBBS student has traditionally been characterized by heavy volume of textbooks such as Guyton, Harrison, and Robbins, and along with challenge of memorizing thousands of pages of complex physiological pathways and clinical protocols. However, as we are moving into 2026, a silent revolution is underway in my study halls and research labs. Artificial Intelligence (AI) is no longer a concept or hypothetical idea it has been my most reliable study partner, redefining my learning, research, and prepare for my future as a clinician.

The End of the "Hefty Book" Era?

For decades, medical education has been based on the "brute force" approach to learning spending hours poring over heavy chapters to find a valuable piece of clinical insight. However, with the advent of AI assistants such as Perplexity and specific medical LLMs, the game has changed. Now, instead of getting lost in 50 pages of a textbook, I can simply ask an AI to "summarize the pathophysiology of heart failure in five key points" or "compare the mechanism of action of different classes of antihypertensive in a table. This is not about avoiding reading; it's about targeted learning. The AI is essentially a high-speed index that allows me to learn the key concepts in a matter of minutes, which I can then supplement with in depth reading if needed. This shift has saved me countless hours, allowing me to focus on clinical rotations and practical skill development.

Simplifying the Complex: The "Explain Like I'm a Med Student" Tool

One of the biggest challenges in medicine is the complex nature of language. Concepts like the "Renin Angiotensin-Aldosterone System" or "MHC Class II presentation" are intimidating at first.

AI helps in breaking down these barriers. Using prompts like "Explain the coagulation cascade in simple analogies," I am able to conceptually understand these processes before moving on to the actual details. In my research work, AI tools such as Elicit and Consensus are now indispensable. What used to take days to complete searching through PubMed, filtering relevant papers, and extracting data is now taking a fraction of time. These tools allow me to process hundreds of research papers at once to answer any query with evidence based result and helping me stay at the forefront of medical innovation.

A Powerful Tool for the Near Future

Looking ahead, the potential of AI in medicine is far deeper. We are moving toward a future where AI will not only just be a study aid for students like me, but also a tool to aid physicians themselves. As students, learning to work with AI today will prepare us for a future where we will be working with AI to diagnose rare diseases, personalize treatment plans and improve patient outcomes. However, the real potential of AI lies in its ability to handle the "data-heavy" lifting so that we can focus on what matters most: the human connection. By allowing us to save time on data memorization and administrative level research, AI can allows us to focus on bedside manner and the art of healing.

Conclusion

The transition from heavy books to high-speed insights is not merely a matter of convenience but a necessity. To an MBBS student in 2026, AI is the bridge between the overwhelming sea of medical information and the precise, compassionate care to our patients. It is time we embrace this technology not as a substitute for our intellect, but as a powerful enabler for our growth as the next generation of doctors.

Life in the Shadow of the Atom: Radiotropic Extremophiles and Their Role in a Nuclear Age

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Abstract

Extreme ionising radiation, long considered an absolute barrier to life, has been revealed as a habitable - and even exploitable - niche for a distinct class of microorganisms. This review examines radiotropic and radioresistant extremophiles, with particular focus on organisms documented within the Chernobyl Nuclear Power Plant exclusion zone. We discuss the molecular mechanisms underpinning their survival, the phenomenon of radiotropism, and - in the context of escalating global nuclear tensions and active armed conflicts - their emerging applications in post-nuclear bioremediation, radiation shielding, and environmental recovery following radiological events.

Introduction

On 26 April 1986, Reactor No. 4 of the Chernobyl Nuclear Power Plant exploded, releasing radiation levels lethal to most known life forms. The immediate exclusion zone was declared a dead zone - an area where biology, it was presumed, had been decisively defeated by physics. Decades later, biologists discovered something extraordinary: not only had life persisted inside the reactor ruins, but certain fungi and bacteria appeared to be flourishing, coating the reactor walls in dark, melanin-rich colonies. These organisms belong to a broader category known as extremophiles - life forms that thrive in conditions lethal to most organisms. Among the most astonishing subgroup are radiotropic and radioresistant microbes, which challenge our fundamental assumptions about the limits of biology and have profound implications for **medicine, astrobiology, and our understanding of life itself.**

Radioresistance: Surviving the Invisible Storm

Ionising radiation - whether gamma rays, X-rays, or alpha/beta particles - damages living cells by fragmenting DNA, oxidising proteins, and generating toxic reactive oxygen species (ROS). A dose of just 5-10 Gray (Gy) is fatal to humans. Yet *Deinococcus radiodurans*, often called "**Conan the Bacterium**," can survive doses exceeding 1,500 Gy. It achieves this through an extraordinarily efficient DNA repair system capable of reassembling hundreds of chromosomal fragments within hours, alongside powerful antioxidant networks that neutralise ROS before they can cause lasting damage.

Within the Chernobyl reactor, several fungal species of the genus *Cladosporium* and *Cryptococcus neoformans* were identified growing directly on highly radioactive surfaces. These organisms share a striking common feature: elevated concentrations of the pigment melanin in their cell walls - the same pigment that protects human skin from UV radiation. Inside Chernobyl, melanin appears to serve a similar radioprotective role, absorbing ionising radiation and dissipating its energy before it can inflict cellular damage.

Radiotropism: Eating Radiation

Perhaps the most fundamentally-challenging discovery is radiotropism - the ability of certain fungi to use ionising radiation as an energy source for growth, analogous to how plants use sunlight in photosynthesis. In a landmark 2007 study, Ekaterina Dadachova and colleagues at Albert Einstein College of Medicine demonstrated that melanin-rich fungi exposed to gamma radiation grew significantly faster than control groups.

Crucially, melanin was shown to undergo radiolysis - it absorbs radiation energy and channels it into biochemical work, driving NADH synthesis and cellular metabolism.

This process, informally termed "radiosynthesis," represents a third major energy pathway for life - alongside photosynthesis and chemosynthesis - and suggests that environments once considered utterly inhabitable may, in fact, sustain entire ecosystems powered by radiation.

Broader Implications: From Chernobyl to the Cosmos

The astrobiological implications are staggering. Mars is bombarded by cosmic radiation due to its thin atmosphere, and the subsurface oceans of Europa (moon orbiting Jupiter) and Enceladus (moon orbiting Saturn) are irradiated by their parent planets' magnetospheres. The discovery of life forms that not only tolerate but harness radiation opens the theoretical possibility of biospheres on worlds previously dismissed as sterile.

On Earth, the applications are equally compelling. Melanin extracted from Chernobyl fungi has been investigated as a potential radiation shield for astronauts. *D. radiodurans* being studied as a vehicle for bioremediation of nuclear waste sites, with engineered strains capable of reducing toxic uranium and mercury compounds in highly radioactive environments where conventional organisms cannot survive.

Microbial Allies in a Nuclear Conflict World

The geopolitical landscape of the 2020s has brought nuclear risk back to the forefront of global consciousness. The Russia-Ukraine war has raised repeated concerns about the safety of nuclear infrastructure - including the **Zaporizhzhia Nuclear Power Plant, Europe's largest, which has been at the centre of military confrontation since 2022.** Meanwhile, tensions in the Korean Peninsula, South Asia, and the Middle East continue to sustain a backdrop of latent nuclear threat.

In this context, the biology of radioresistant extremophiles has acquired a dimension of applied urgency it previously lacked. A nuclear strike or a conflict-induced reactor breach would render large tracts of land biologically uninhabitable for decades - Not merely through blast damage, but through long-term radioactive contamination of soil, water, and air. Conventional decontamination technologies, such as chemical washing and physical excavation, are costly, logistically prohibitive in active conflict zones, and they generate secondary radioactive waste. Radioresistant microbes offer a compelling biological alternative.

Engineered strains of *Deinococcus radiodurans* have already demonstrated the capacity to reduce soluble uranium(VI) to insoluble uranium(IV), effectively immobilising radioactive heavy metals in contaminated soil - a process known as bioremediation. Similarly, sulphate-reducing bacteria naturally present in contaminated groundwater can precipitate radioactive caesium and strontium as insoluble sulphides, preventing their spread through water tables. Deploying purpose-designed microbial consortia into post-strike zones could accelerate natural decontamination timelines from centuries to decades.

Beyond remediation, melanin harvested from Chernobyl fungi - particularly *Cladosporium sphaerospermum* - is being investigated as a biological radiation shield. NASA has expressed interest in melanin-based shielding for long-duration spaceflight, but the same material holds potential for protecting emergency responders, military personnel, and civilians operating in or near radiologically contaminated environments. Unlike lead-based shielding, melanin is lightweight, biologically compatible, and can theoretically be produced at scale through fungal fermentation. Extremophiles also present an intriguing possibility for the development of direct radioprotective therapies.

Many radiation-resistant microorganisms produce unique antioxidants, DNA-repair enzymes, and protective pigments that allow them to survive extreme ionizing radiation.

These biomolecules can potentially be isolated or engineered into pharmaceutical formulations to reduce radiation-induced cellular damage in humans.

In the future, extremophile-derived drugs could be administered before or after radiation exposure to mitigate acute damage and lower long-term health risks. Although still largely experimental, this approach highlights how extremophiles may serve not only in environmental bioremediation but also as a promising source of next-generation radio protective medicines.

It is important to acknowledge the ethical complexity of this intersection. The militarization of biological research - even for defensive and remediation purposes - demands careful international regulatory oversight. The application of microbial biotechnology to nuclear conflict scenarios must be governed by transparent scientific governance to ensure these tools remain instruments of recovery, not escalation.

Conclusion

The fungi and bacteria inhabiting Chernobyl's ruins are far more than scientific curiosities - they are potential tools for humanity's response to one of its most devastating technologies. From melanin-shielded colonies on reactor walls to engineered strains capable of immobilising nuclear contaminants, radiotropic extremophiles sit at the intersection of fundamental biology and urgent global need. As armed conflicts increasingly threaten nuclear infrastructure, and as the spectre of radiological weapons remains a grim feature of modern warfare, the science of radiation-resistant life has never been timelier.

Investing in this field is not merely an academic exercise - it may prove to be a critical component of post-conflict environmental recovery in the decades ahead.

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Nature's Blood Converter: The Enzyme No One Expected

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Introduction

Blood is most important fluids in the human body, which is composed of different components such as red blood cells, white blood cells, platelets, and plasma. Each and every part has different job like, red cells carry oxygen while white blood cells fight with infections, platelets help in clotting of blood, and plasma circulates nutrients and hormones within the body. The RBCs are the most important factor in blood grouping. On the surface of these cells, there are small sugars-like structures are present that are called antigens, and these antigens decide which blood group a person belongs to. If the red blood cells have the “A antigen,” the person has A-type blood; if the person carry the “B antigen,” then they have B-type blood; if both antigens are present, then they have AB-type blood; and if neither sugars are present on the surface of RBCs then the person is O-type. This system functions because our genes are encoded how to make these specific enzymes and tell the body to add these sugar molecules during early development. So, all of our blood group identity in which our body revolves around is what kind of sugar coating is present on the outer part of the red blood cells. Let's discuss something that researchers found which seems to be impossible.

For many years, biology students like us have learned that blood groups are fixed. If someone has A then, they always have A. If someone has B, AB, or O antigen, then they have always same type of antigens. But in recent discovery, scientists found something that feels almost unbelievable for first time. They found an enzyme, which is in the human gut micro biome that convert blood group **A** into “universal donor's. When first time we read about it, it sounds like almost unbelievable, but the more we looked into it, the more fascinating it seemed.

Why blood groups matter in the first place?

Before knowing more about discovery, it needs to understand that why were the blood groups are different. Our red blood cell outer part is covered with small sugar molecules called **antigens**.

- Those with **A-type blood** have **an antigen**.
- Those with **B-type blood** have **B antigens**.
- People with **AB** have both.
- And **O-type** blood has none of these extra sugars.

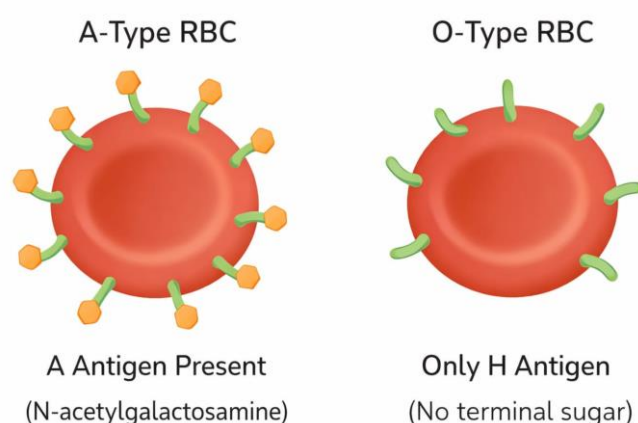


Figure: Structural difference between A-type and O-type blood group antigens on red blood cells.

This is why people with O-type blood are called “universal donors” since there is no A or B antigen, their blood doesn't trigger immune reactions easily. The main problem is that O-type blood is always present in short supply because of this many medical emergencies depends on it.

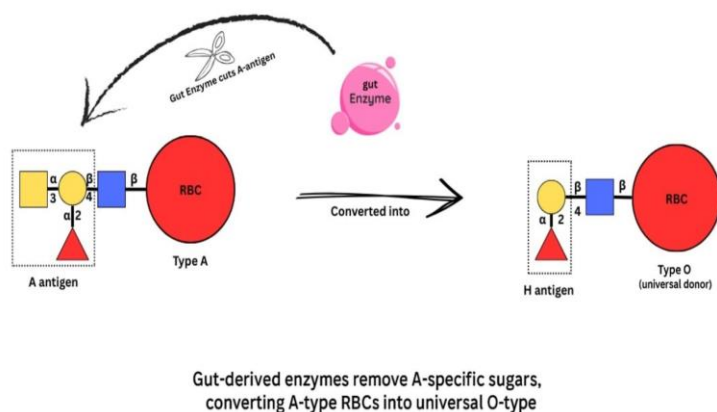
Just think that if scientists could take the more common A-type (or even B-type) blood and **clean off** the A antigens and then it transforms into O-type. This discovery can solve a big shortage in hospitals and make blood transfusion safer and more flexible.

The surprising role of gut bacteria

The surprising part is that the key to doing this didn't come from a lab chemical or a synthetic enzyme. Instead, it came from something living inside us which are **gut bacteria**.

Our gut has trillions of bacteria that help in digestion of food. In this process, the bacteria break down complex sugars because of this some scientists wondered: "If gut bacteria can remove sugar molecules from food, could they also remove the sugar molecules that make the blood A-type?"

This simple curiosity pushed researchers to explore thousands of bacterial genes from the gut micro biome.



How scientists found the blood-converting enzyme?

The researchers created something that they named as **met genomic library**. In short, they took DNA from gut bacteria of humans and cut them off into pieces, then put each and every piece into an *Escherichiacoli* bacteria (work as vector). Then they tested each and every piece of it to see that they are producing an enzyme that could cut the A antigen or not.

It looks very easy but it's not because they screened almost **20,000 DNA samples**.

But researchers only found two enzymes from gut bacterium of human known as **Flavonifractorplautii** that works really well.

These two enzymes work simultaneously:

- The first enzyme is **deacetylase**, which remove out a small chemical group from the antigen A.
- The second enzyme is **galactosaminidase** and they cut away the sugar that defines the blood group A.

When both enzymes work finished then the RBCs loses antigen A and started behaving like **O-type** RBCs.

What's really amazing about is that these enzymes work very well even if they are in low concentrations, which is important for real-world medical use.

How this process really changes the blood

When the A antigen is removed from the red blood cell surface, what's left on the surface of cells is called the H antigen and the H antigen is naturally found in O-type blood. Scientists tested this on real human red blood cells and confirmed that the conversion was complete and stable. That means the converted O type blood is just not looks like O type, it also behaves like O type, when it was tested with antibodies.

Why this discovery could be a huge breakthrough

If this modified blood safe enough to use in hospitals, it completely changes how blood banks work.

1. More universal blood available

O-type blood is always in demand because doctors can use it for patients of any blood group in emergencies. Being able to convert A-type blood (which is very common in many populations) into O-type. So, this will massively increase supply.

2. Less wastage of donated blood

Sometimes blood banks face shortages of certain types and excess of others. When excess A-type blood can be converted into O-type, wastage also becomes minimal.

3. Safer emergency treatments

In critical situations like accidents, surgeries, delivery (childbirth) complications the doctors do not always have time to check someone's blood type. This modified universal blood type solves that problem.

4. Could help in organ transplants too

In some recent studies researchers found that these enzymes might also help in removing antigens from donor organs, making transplants less dependent on strict matching and avoid auto immune rejection.

What challenges still exists

Even though this discovery is promising, it is not ready for medical use yet because scientists still need to test:

- whether all A antigens were removed every time
- whether this modified blood is safe for long-term transfusions
- whether these enzymes cause any side effects
- how to increase enzyme production for clinical use

Plus, anything involving blood goes through extremely strict regulation before approval. But the fact is that, this idea moved up from theory to laboratory success, which is already a big step for medical industry.

Conclusion

The discovery of a gut-bacteria enzyme which converts blood group A type into “universal donor” O is one of the greatest developments in modern transfusion science which combines microbiology, genetics, biochemistry, and medical innovation in a way that feels both futuristic and deeply practical. But after all this clinical use of this research will more take time and the idea that we can convert A-type blood group into life-saving “universal donor” O type blood has the potential to the way of healthcare worldwide. What started as curiosity about gut bacteria may one day become the reason countless lives are saved. And that's the beauty of science. For Example: **big breakthroughs hide in the smallest corners.**

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IPR in biological research and innovation

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Head of Department of Biotechnology

A set of rights or laws that protects intellectual property, which includes all types of creations of the human brain, including inventions, books, drawings, etc., is called "Intellectual Property Rights" or IPR. As for the term "an idea", an idea can be anything like a device, a software code, a way of writing, an image, an audio file or a video. These IPR's are very useful in case of biological sciences due to their clarity, specificity and ability to allow sharing of biological works widely, safely and efficiently. Think about you spending months isolating a fungus that can degrade plastic. You name this fungus after your mother and present the results during your seminar or conference at university and then there is a company that has started marketing the same fungus and making crore of rupees without informing you. You must feel cheated, isn't it? The company did nothing wrong because you didn't get a patent for your work, and IPR does not exist for you and your work. IPR is just a set of guidelines so that no one uses your work without your consent. IPR can be categorized in following types.,

1. Patents: A patent gives you the exclusive right to manufacture, use or sell an invention for approximately 20 years. In the Biological Science field, you can patent a genetically engineered mouse, a new vaccine formulation or even a procedure for gene editing. Example of Patent: For Insulin – This hormone saved the lives of many diabetic patients. Initially, when it was developed using genetic engineering technology and patented, only one company had the license to produce it commercially. It allowed them to produce it in bulk.

2. Plant Variety Protection: You cannot apply for a patent on a wild mango tree that grows in your neighbourhood.

But if you take two different types of mango trees, combine them using a method called cross-breeding to create a better, disease-resistant version, then you will receive a special certification for the new plant variety. In India there is the Protection of Plant Varieties and Farmer's Rights Act therefore, you can obtain legal recognition of the right to use seeds that your grandparents kept, saved and used by themselves.

3. Copyrights: It is granted for written content, such as your project report/thesis, an easier-to-understand drawing of biochemical pathways you created, or a time-lapse video of fungi growing on an agar plate, or a rangoli you created. With copyrights, you do not allow anyone else to copy/paste your work. However, copyrights do not cover the concept of a new drug, but rather written descriptions of those drugs can be copyrighted.

4. Trade Secrets: It is the most secretive form of patents. For example, a company may develop a unique media that is necessary for stem cell development. They may choose not to apply for a patent because they would be required to disclose their exact formulation. As a result, they will store their product in a vault and have each employee sign a Non-Disclosure Agreement (NDA) before being permitted access to the vault. The famous "HeLa" cancer cells were taken from Henrietta Lacks without her knowledge. Unfortunately, at that point she had no intellectual property rights protections available to her. In today's world, this could never happen again.

5. GI Tags: The Geographical Indication Tagging system allows producers to apply for legal protection for certain products based upon the location where they originated.

Products with geographic indications are associated with a particular region and/or area and acquire a name or reputation from that region. Examples include Kalanamak rice known for its specific aroma and taste grown in Siddarth Nagar District in Uttar Pradesh; these rice varieties are GI tagged due to the combination of unique soil conditions and climates found in that district. Therefore, no other farmer can produce the same type of rice in another country and legally market it under the name Kalanamak.

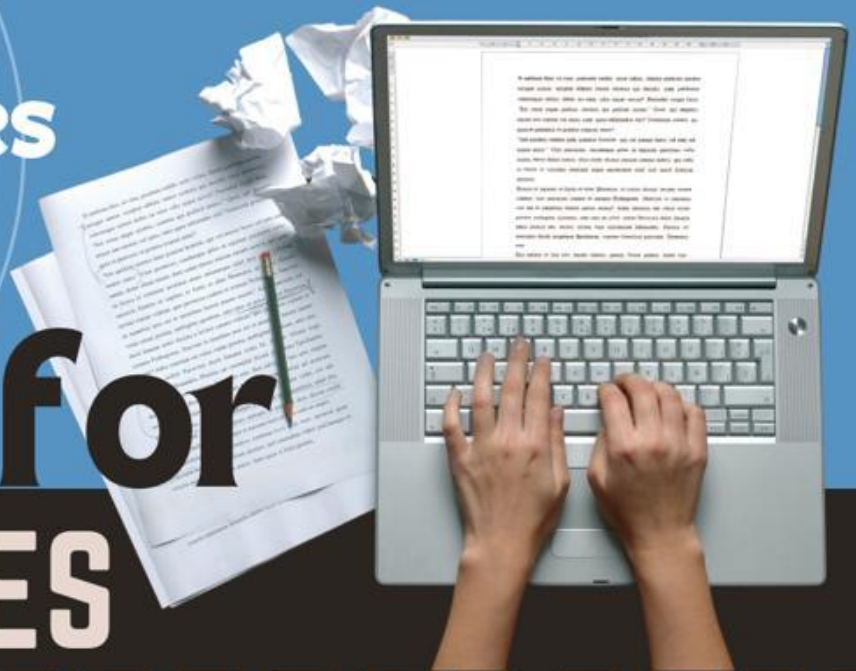
If you want to protect your idea, invention or creation, you have to file a patent with the Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM). It can be manual or digital, based on your choice. Nowadays, most researchers fill it digitally at ipindiaonline.gov.in. If your product or invention is not fully prepared, you can file a provisional application, which can give you about a year to finish. The complete patent requires full technical details of the working of your invention. After filing a government official will visit and examine your invention or prototype, and may raise questions about the uniqueness of your product. After proper checking, a certificate will be granted for your application. A patent in India only protects you in India. If you want to protect your idea in other countries such as US, Europe or Japan etc.

World Intellectual Property Organisation (WIPO). As a student or a young researcher, you should document everything in the form of drawings or text in your notebook with dates and proofs when you do your dissertation work. The IPR laws are tricky and complex in nature, so if you are serious about your product or prototype, you may consult a patent agent. The Indian government provides financial assistance through **KAPILA (Kalam Program for IP Literacy and Awareness)** scheme to students and new start-ups. Along with it an IPR is granted to the person who files it first. If the same idea or creation is filed five minutes before your idea, you might not get the IP right for your product.

Intellectual property rights are key to making our findings available with proper safeguards against any form of misappropriation. With patents granted, findings can then be communicated freely, but still ensuring that credit goes where it belongs. The contribution of society is made when scientific findings are shared in a practical form and on a widespread basis. However, the lack of safeguarding, particularly at the early stage of idea formation, has always made researchers keep their findings from others or communicate them informally. **Your idea is your property. Build it, protect it, and then share it with the world!**

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