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BEYOND SC!ENCE MAG

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**Cover star**

# Prof. Dr. Eleonore Soei-Winkels

***Founder, Postdoc transformation***

*If you want to become scientist for the right reason go for it.*

# HOW DOES A DAY IN YOUR LIFE LOOK LIKE?

Before my family is awake, I start with daily marketing for my business PostdocTransformation. If I don't lecture that morning, I wake up our kids and get them to primary school and kindergarten. Between 9 - 15 o'clock, half of that time, I focus on my business by networking, improving my tech stack, selling to graduate schools, serving my community of early career scientists, and check-in with my team etc. The rest of that time I work as a professor and lecture, guide students, grade exams, read and assess dissertations etc. Everyday I pick up my kids and spend the afternoon until their bed time with them, supervising their homework while I do some household chores, and we have family dinner. On some evenings I have lectures, so my husband puts our kids to bed.

# WHAT ADVICE WOULD YOU LIKE TO GIVE TO YOUNG SCIENTISTS?

A great performance in your Master degree, lack of job alternatives after the Master, reluctance to enter the non-academic job market; all three are the wrong reasons to pursue a PhD. If you want to become a scientist for the right reasons, go for it. But please do so with due diligence: the chances to become a professor are very small. Academia is not fair for underprivileged, underrepresented and underserved scientists. Some disciplines have better career prospects than others. The nature of delayed and rare gratifications in overall science can be depressing. So please reflect, whether you have enough resilience, resources and confidence to endure the tough times in your PhD. Follow role models in social media to make an informed decision prior to start a PhD or a postdoc. Also consider the benefits and opportunity costs of a PhD or even a postdoc and professorship. Reflect on your chances to transition your career into industries and business parallel to your research. Why? Because you don't have to put up with toxic leadership and bad career prospects and low salaries, if you have good alternatives.

# HOW IS YOUR EXPERIENCE BEING A CAREER COACH?

Since 2014, I have inspired & prepared PhD students, candidates & postdoc scientists to transition their careers into business in my local vicinity in Germany. Since 2021, future-proof graduate schools can book our #postdoctransformation digital services as a scalable & sustainable career booster. For their PhD students and postdoc scientists, we host customized e-learning courses, available 24/7/365 on their own mobile devices. I review individual job applications and we do interview and contract negotiation mock-ups in subsequent live online group workshops. Our newest service is the year long group membership along the job hunt. The future-proof graduate schools know, that thriving PhD holders in- and outside of academia will build the graduate school's reputation. Why? Because this will then attract new PhD students and foster financially lucrative industry partnerships.

# HOW CAN INDIVIDUAL SCIENTISTS BENEFIT FROM YOUR EXPERIENCE AS A SERIAL CAREER TRANSITIONER?

In our free email course career transition made easy, early career scientists can learn in 10 monthly actionable and bingeable emails step-by-step how to confidently leap into business. Sign-up here: https://postdoctransformation.activehosted.com/f/4


**Cover star**

# Daniele Gregori

*Theoretical high energy physicist*

*Be not only a "calculation slave", but a real "theoretician", able to have deeper "conceptual" insights!*

# WHAT DOES A PHD IN THEORETICAL PHYSICS DEMAND?

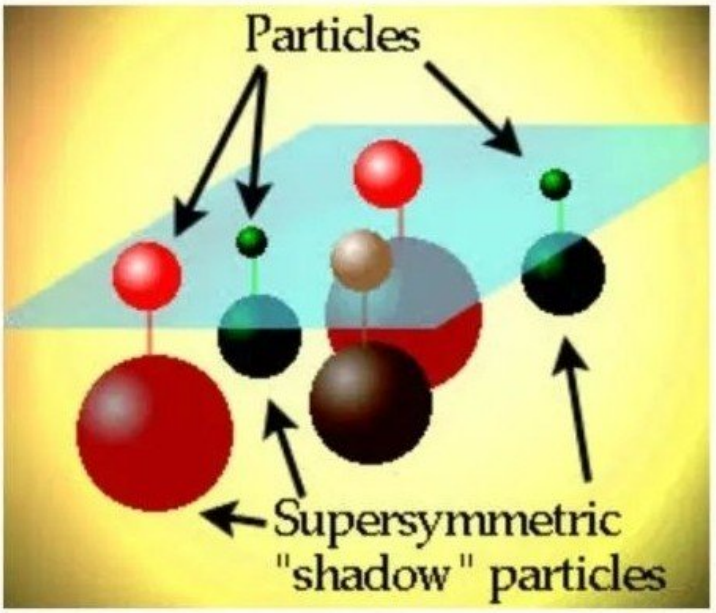
Of course it depends a lot on the particular case, especially through the topic of research and supervisor you have. However, in general I would like to point out three things. First, even if students are interested to theoretical physics often because of its generality and maybe philosophical significance, actual work in it is far from similar to that. Geniuses can indeed think to philosophy of physics and revolutionise it, but normal Ph.D. students are more similar to "calculation slaves", for a very special research topic of often very narrow interest.

*"It requires more "precision thinking" than "general ideas".*

The latter at first often are given by the supervisor, given also the complexity of modern theoretical physics, and in any case typically are not very "general". Second, as in any Ph.D. it is important to be able to bear the psychological pressure which can be high, either for the large amount of work or for your supervisor's demands and character. A third very important thing is "belief in your project". It is not always granted, since the project at first is often highly constrained by your context and chosen by your supervisor. I did not believe in my project for most of my Ph.D., when it involved supersymmetry only as a particle physics theory. Then fortunately and unexpectedly we discovered the application to black holes and gravitational waves, so I started to be enthusiastic, much more motivated to work hard on my research project. That strong motivation is probably what is most needed for success in a very hard, tough and competitive field.

# HOW DO YOU SEE SUPER SYMMETRY AND WHY DID IT COME INTO EXISTENCE?

Supersymmetry was first inspired by String Theory as a purely theoretical development of particle physics, but turned out to have also a wealth of phenomenological implications and possible solutions to many problems of the Standard Model. In this sense it is a symmetry between “matter” and “force” particles, by which for each known particle of one kind there may exist another particle of the other kind, at high enough energy.




However, I don’t view supersymmetry in this sense, I view it mainly as a tool for other kind of physics. Indeed certain supersymmetric theories (called “extended supersymmetric”) are very rich mathematically and subtle physically, so that they can provide convenient descriptions of other kind of physics, like quantum gravity (via holographic duality) and more recently black holes physics.

# CAN YOU TELL MORE ABOUT YOUR PAPER?

I started working on my last paper with my supervisor Davide Fioravanti and the Postdoc researcher Hongfei Shu more than two years ago. It was thought initially as a generalisation of the new approach to (so called extended N=2) supersymmetry through so called “integrability”, which I and my supervisor had invented but first realised only in for the simplest theory (without matter). By the way you can consider integrability as a collection of mathematical techniques able to solve “exactly” or “non-perturbatively” certain physical models, that is for any value, large or small, of the physical parameters. It involves often fancy and unusual mathematics and that was the reason I chose to specialise in it.

So we proceeded for a long time the generalization of the new gauge/integrability duality we had found. We were often stuck in technical difficulties which one can expect for generalisations: it is hard and boring work, but worth doing to prove the value of your research! Meanwhile the application of supersymmetry to black holes was discovered and we also discovered an application of integrability to it and an (at least mathematical) explanation of the former application.

The reason why you can connected the three different physical theories is, simply put, that the you have a the same differential equation associated to all (in different parameters and with different role of course). In particular for black holes that is the equation which governs the behavior of the spacetime (or other field) in the final phase of black hole merging.

The amazing thing is that the black holes involved are not toy models or other unphysical black holes but the real black holes, for instance those predicted by General Relativity, or also more interesting refinements of those through String Theory or modified theories of gravity. So we are finally able connect our mathematics to real physical observations, thanks to gravitational waves! In particular our application of integrability to black holes consists in a new method (a non linear integral equation typical of integrability, called Thermodynamic Bethe Ansatz) to compute the so called quasinormal modes frequencies which describe the damped oscillation of spacetime. We were able to write a short paper on this new application already last December, but in this new paper we give more details about that.

**Integrability, susy $SU(2)$ matter gauge theories and black holes**

Davide Fioravanti*, Daniele Gregori* and Hongfei Shu[†,††]

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**Abstract**

We show that previous correspondence between some (integrable) statistical field theory quantities and periods of $SU(2)$ $\mathcal{N} = 2$ deformed gauge theory still holds if we add $N_f = 1, 2$ flavours of matter. Moreover, the correspondence entails a new non-perturbative solution to the theory. Eventually, we use this solution to give exact results on quasinormal modes of black branes and holes.

*I am currently working in the field of autoimmune disease research and development of potential treatment strategies for such diseases.*

Cover star

# Anastasiia Novikova

*Master in biomedicine*
*University of barcelona*

## *How does a day in your life look like?*

My day starts with a cup of coffee with milk and breakfast to recharge. Then I go to the university, where I spend the first half of my day. Starting from 9:00 in the morning, my couples start and end around 13:00. After that, I take the subway and go to my favorite job at the Josep Carreras Leukemia Research Institute, and there I work on my project - the master's final thesis. Already in the evening I return home and read study materials for the university. The finale of my day is sleep!)

## *Can you tell more about your field of biomedicine?*

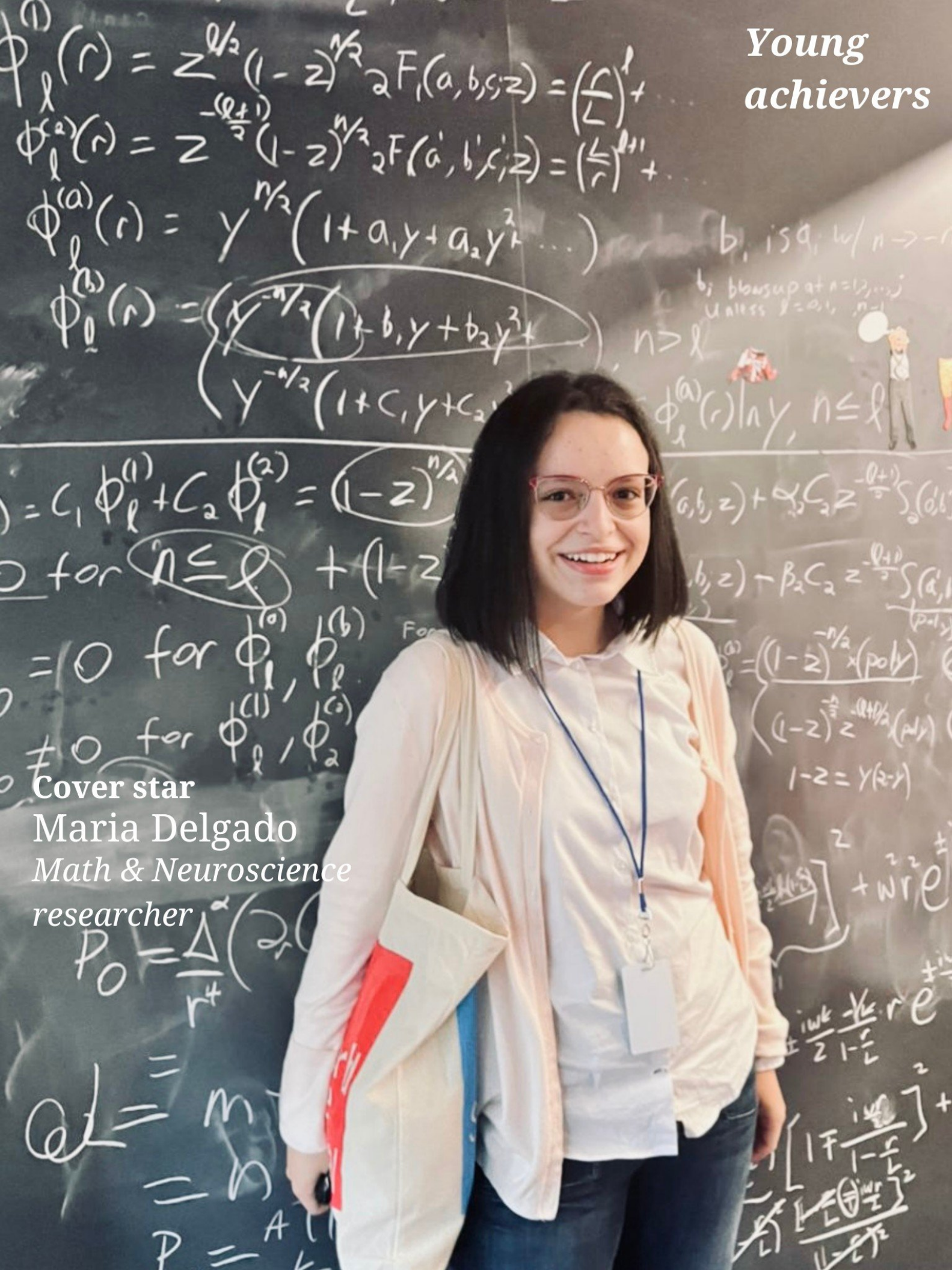
Entering the University of Barcelona with a master's degree in Biomedicine, I had the opportunity to choose 1 of 3 possible specializations. The first concerned the study of human pathologies (more general), the second study of research in oncology and the third study of metabolic disorders (the last two are more narrowly focused). Since I have not yet decided what I want to do in the future, I chose a general direction. I am currently working in the field of autoimmune disease research and development of potential treatment strategies for such diseases.

## *What other activities you like to engage in apart from studies?*

I have a few hobbies that I love, including photography, my blog, and traveling. I really like to travel, especially to places connected with some historical events, secrets, and stories. It is very interesting for me, and I love history very much, of course it is difficult to remember all the dates and names, but it is still very interesting for me, and sometimes there is a desire to be at least for a moment in this or that period in order to see everything with my own eyes; photography allows me to see the beauty in things that other people may not notice and I think that is important when you can find beauty in almost everything. These are the extracurricular activities I have.

## *Can you tell us about your studying practices?*

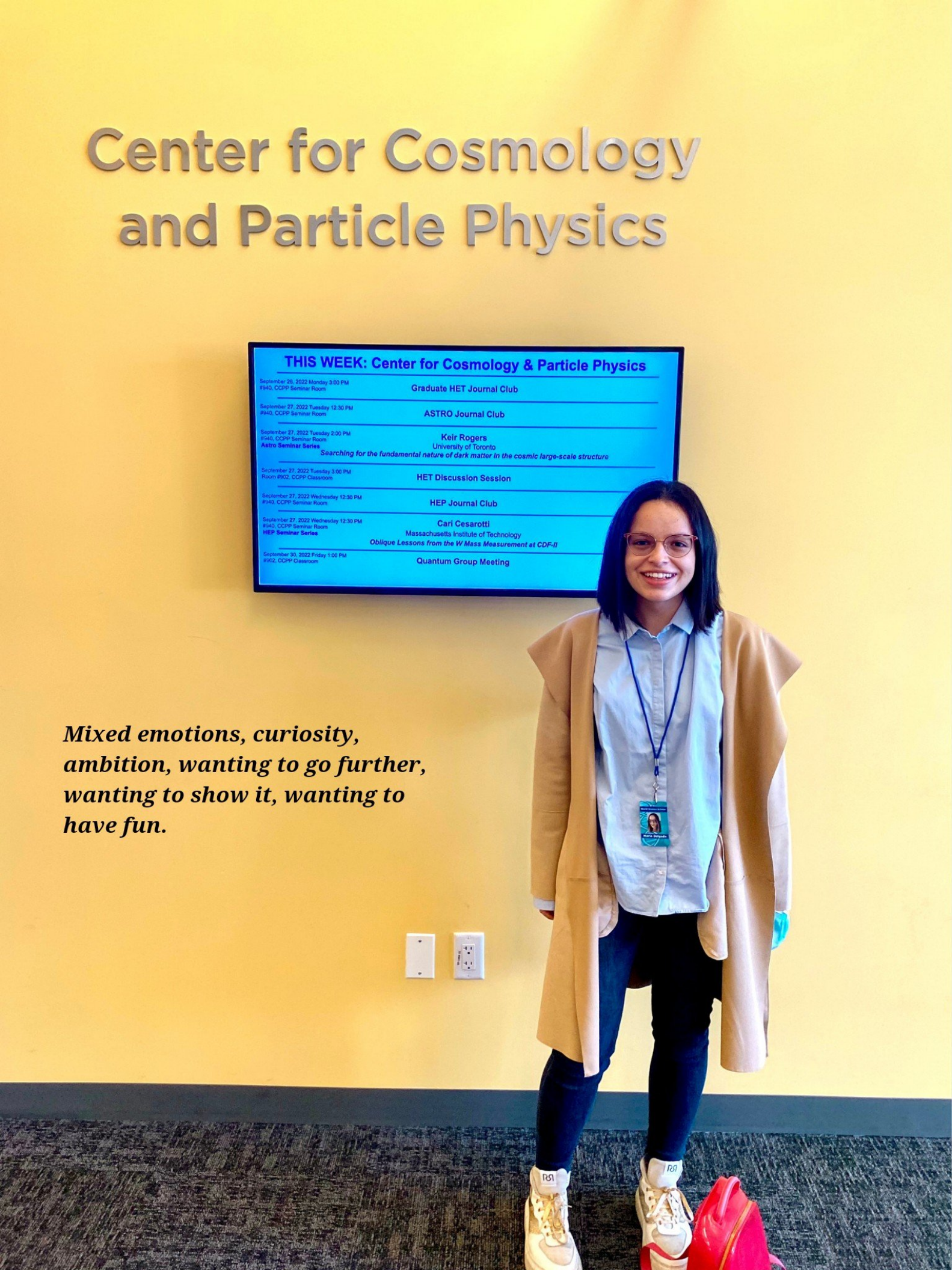
Regarding my studies, I can say the following: I have always spent a lot of time writing notes by hand, but now I have completely switched to a laptop (i.e. electronic notes). I make basic notes during lectures, after which I bring everything back to normal at home, add what I missed (it's a good thing teachers dump their materials). I built my preparation for the exam according to the "1,2,5,7" system: it means repeating the material 7 days before the exam, then 5 and so on... I always highlight the main ones (in my opinion), if there is any terminology, I use flash cards according to the same system as exam preparation. This is probably the main points of my study practices.



**Cover star**

Maria Delgado

*Math & Neuroscience researcher*




***Mixed emotions, curiosity, ambition, wanting to go further, wanting to show it, wanting to have fun.***

# HOW DOES A DAY IN YOUR LIFE LOOK LIKE?

I would define myself as a teenager who breaks the stereotype that society has of generation Z. In the morning, I am an International Baccalaureate student at King's InterHigh online school. In the afternoons and evenings, I focus on my courses and personal projects. This is when all my motivation comes to the fore, focusing on mathematics, neuroscience, and physics. I have to say that the school I am in offers me a lot of flexibility in having a role as a young researcher and mathematician at a young age and being exposed to many rigorous programs that require minimal time and effort per week. However, my passion for learning and acquiring more knowledge does not end here! I am passionate about world literature and science fiction books, or books that purport to show the hidden sides of society. I am currently writing two books at the same time, as both ideas came to me at the same time and I couldn't decide! One is about what is really what we know as a family. It is set in a dystopian parallel world in which the multiverse can be understood in a fairly straightforward way. The other book is a representation of society, and how it is trying to define all teenagers in the same way, without taking into account that everyone is different and that we can make our own choices.

# HOW DID YOU ACHIEVE TO BECOME A WORLD SCIENCE AND BEYOND RESEARCH SCHOLAR AT SUCH A YOUNG AGE?

I am a person who has always wanted to go beyond the normal curriculum. I found a passion, something that called me in a very intense way in everything I was told and explained in class, but I didn't know concretely what it was that was going on in my head. Mixed emotions, curiosity, ambition, wanting to go further, wanting to show it, wanting to have fun. Thanks to this mental explosion, so to speak, I decided to embark on my personal path to new opportunities that were not anchored to what I was studying in class. I also had the support of my family and teachers, my role model; Elena Mengual.

I discovered these programmes thanks to the internet searches I did every day. I would sit down for at least an hour a day to search through many websites to find out what programmes or courses I could sign up for at such a young age.

World Science Scholars is a selective programme created by the World Science Festival. Each year a cohort of students from across the globe are selected to expand their mathematical abilities by applying math to the sciences as they participate in inspiring college-level experiences led by world-renowned scientists. Fields addressed range from astrobiology to computational programming to neuroscience. I was selected as a Scholar in 2021, and I have had the opportunity to interact with super interesting people and share interests like I would never have imagined before.

BeyondResearch is a programme to raise the next generation of global leaders in STEM research. It is highly selective and only 5 spots are available per year. The BeyondResearch programme is part of PhysicsBeyond; but PhysicsBeyond runs also the programme Physics From a Researcher's Point of View (RPV). This programme is open to everyone interested and happy to put in the work to benefit from it. It is much less demanding than BeyondResearch, but it can still be considered hard for a high schooler, and is targeting gifted and talented students. I was selected as a Scholar this year 2022 and we are learning to develop our soft skills, as well as getting into Abstract Analysis and Differential Geometry. This is all thanks to the mentor, and creator of the programme, Dr. Bàr.

In addition, I participate in the New York Academy of Sciences research programmes, where they choose the leaders of the future to present them with challenges so that we can build our solutions through our knowledge as a team.
I have won the award for the best STEM student in Spain, as well as the title of Junior Innovator for all the courses and academic merits I have received. The Spanish Government recently selected my profile to be an inspiring woman in the country, as a young researcher and mathematician. I have been included on the website of people of reference in Spain. The city council of my city, Huesca, received me a few weeks ago to congratulate me on my achievements.

# WHAT ADVICE WOULD YOU LIKE TO GIVE TO OTHER TEENAGERS WHO WOULD LIKE TO DO SOMETHING IN THE STEM FIELD?

I would like to tell them to go for what they like best, don't give up. I know that many will think that they have no future, other than to be normal people, but we are all born to be change makers; you don't have to be a genius to make an impact! The important thing is to find something that motivates you, something that makes you curious and throw yourself completely into it, preventing anyone else from telling you otherwise. Don't let anyone tell you that you are not capable of doing something; rather, show them all the hidden talent you have. By this I don't just mean science, I don't just mean academics, I mean anything! The world of tomorrow is just around the corner and we are still living with the same habits of the past, we cannot be anchored to the same way of living, we need a change. That change is generated by us through our talent, seeing that everything we do is interdisciplinary, and can have a very good impact for everyone.

# WHAT ARE YOUR FUTURE PLANS AND GOALS?

My academic goal is to study pure mathematics and neuroscience at university. I hope to be able to do a lot of research in these two fields that can lead to a major breakthrough as new theories or ways of understanding are developed. My idea is to go all the way to a PhD in mathematics, I don't know what I want to specialise in yet, but it is very clear to me that mathematics and I have a very strong connection. I want to be able to pass on knowledge to future generations, and for that I want to do research. I am not saying that I only want to dedicate myself to this, although I do want to do some of it. I'm not giving up teaching so that I can pass this on even more directly, although I'm still thinking about it!
My goals at the moment are in various research and projects that I am carrying out. However, one super important one is to show the world that if we all manage to find our spark, our engine of curiosity, we can achieve great things together!

**Cover star**

Buella Parivallal

*Founder, Dendrite Laboratories*

# HOW DOES A DAY IN YOUR LIFE LOOK LIKE?

I usually wake up at around 7:00 AM, freshen up, and consistently meditate, even if it is for 10 minutes every day. I keep my mornings for personal time to carry a positive and active mindset throughout the day. My breakfast is a simple protein shake, and I prepare a protein powder with dry fruits at home every 2 months. It takes less than 10 minutes to make and have my protein shake.

I head to the lab at around 9.30 AM, and the first thing I do is set up my laptop, clean the space where I sit and keep it as minimal as possible. Later I spend at least half an hour putting up a to-do list of the tasks that need to be completed for the day. Afterwards, I go out, have a cup of coffee, and prepare for the day at the lab.

I usually do a lot of literature reviews before and during the experiments to gain knowledge to innovate new ideas. Once I'm done with my day at the lab, I head back home and take up any important task that needs to be completed for my start-up. I break down and assign tasks to my team members, have online meetings with the team, and follow up on the progress.

Later, I binge-watch any series (currently The Modern Family) and try to respond to e-mails or phone calls I missed during the day. I try to make a quick note on my phone of any pending tasks before going to sleep so that I don't wake up feeling anxious.

# HOW DID YOU START YOUR ENTREPRENEURIAL JOURNEY? AND MORE ABOUT YOUR STARTUP?

Science has fascinated me since childhood, from questioning our existence to trying to solve the problems in my head. Over time I had the opportunity to be educated in the field of Biology and explore more about the applications in the area.
During my three years of working as a Senior Research Fellow at the University of Agricultural Sciences, Bangalore, I explored the application of biotechnology in the field of Agriculture. I had the opportunity to develop an isothermal gene amplification technology to rapidly and accurately detect plant pathogens that could help yield losses and was economically profitable.

Innovating the enhanced technology of LAMP assay, I started to work on developing a point-of-care diagnostic kit with zero equipment usage. This kit majorly led to the beginning of my start-up journey. On January 25th 2019, a molecular diagnostic laboratory for the development of a diagnostic kit which is known as "Dendrite Laboratories Private Limited" initiated.

Dendrite Laboratories has been a significant part of my growth in providing exposure to the industry and meeting experts, leading to my project plan's evolution. This marks a stepping stone for the entrepreneurial journey with the initial innovative idea and enormous societal and market impact.

I have always believed in the saying, "The more you sweat in training, the less you bleed in the battle". This has helped me practice and keep trying until I get it right. I realise that the entrepreneur journey is not a piece of cake. It mainly requires a strong mindset and a lot of research and analytical background work. With this incredible experience, I realised that failure was just the beginning of exploring the path. When I became the finalist in DBT BIRAC-BIG and did not receive the grant, I realised where the effort must be put, which was the biggest lesson I learned. Still, later, when I was the finalist in ELEVATE and became the runner-up, I looked back to have found the initial business model to be so much more enhanced and more than the plan. I had a strong mindset and the ability to correct and learn from my mistakes. This helped me to understand that failure is just a medal of your effort.

The perseverance of trying to raise funds after multiple rejections rewarded me abundantly when I received a grant amount of 50 Lakhs from the Biotechnology Ignition Grant on my third try. Currently, we are working to validate the diagnostic kit and scale up the product from "Lab to market".

# CAN YOU TELL MORE ON YOUR RESEARCH?

I'm working on enhancing various diagnostic tools using isothermal gene amplification methods like Loop-Mediated Isothermal AMPlification (LAMP), Recombinase Polymerase Amplification (RPA) and Helicase Dependant Amplification (HDA) assays.
Early and highly specific detection and diagnosis of plant diseases and their causative agents are key factors in crop production and the reduction of both qualitative and quantitative losses in crop yield. Given the advantages of the isothermal gene amplification techniques, many microdevices integrating isothermal amplification methods have been developed for the detection of nucleic acids. A rapid, accurate, sensitive, and specific diagnostics are essential for protecting plants from pathogens. With the use of isothermal amplification methods like LAMP assay which are faster and can proved to be economically profitable, provides the amplification at molecular level with a constant temperature and do not require any sophisticated equipment, going beyond the laboratory can be made a reality for molecular diagnostics. The amplification stage ceases to be limited by time and equipment and can be put to use in poor-resource setting laboratories.

So, currently we are working on detection of BLAST disease associated with rice crop using Recombinase Polymerase Amplification assay coupled with Lateral Flow Assay (LFA). RPA is one of the most powerful isothermal gene amplification technique which could be a next gold standard technology to create a revolution in the molecular based testing methods. The test results obtained in this assay is faster and robust and can be used in point-of-care diagnostics. And the interpretation of the test result is made easier with the LFA strips.

# WHAT ARE YOUR FUTURE PLANS AND GOALS?

In the coming years I would like to network and collaborate with labs that are working on similar technologies. In the next one year's time I would like to build a strong team that is well-rounded. Also, educating myself in understanding the market research and analysis, feasibility analysis, economic modelling, product positioning, go-to-market strategies, and/or other market and industry analysis depending on the customers' needs. Understanding the Agri-Tech sub-sectors in Indian startup ecosystem and creating networks in and around the agricultural value chain would be a major goal.

As a short term plan, I'm currently working on launching the first two products from the startup which is a "LAMP Colorimetric Based Diagnostic Dipstick" (Indian Patent: 401825) and a foldable "LAMP Foldable Microdevice Membrane Platform".

So, as a short and a long term goal I would like to be an educator in simplifying life sciences to young researchers. Finally, I would like to establish a resourced molecular diagnostic lab where we innovate and develop customised diagnostic tools in both Agriculture and Clinical sectors using advanced isothermal gene amplification technologies.

Green Chemistry

# ROLE OF CERAMISTS IN GREEN CHEMISTRY

**By Leo Ayesha**

As everyone is considering Green Chemistry on a very serious note, how can we follow its rules/principles being ceramic analysts?

*"Green chemistry is now securing a very important role in our researches and inventions".*

Our innovations ought to follow the defined principles of Green Chemistry. One of these principles is recycle.

In ceramics, we used to deal with earthenware, stoneware and porcelain. To attain their very high sintering temperatures, we need excess fuel for combustion. But now, in order to meet the principles of Green Chemistry, many kinds of waste materials are incorporated as raw materials of earthen bricks to reduce the sintering temperature of the process thus reducing the need of fuel for more combustion. Moreover, it recycles the waste materials to reduce land and water pollution.

When there is less combustion, lesser amounts of greenhouse gasses are produced. As a result, the atmosphere remains balanced and free from global warming. Global warming is increasing at a very alarming rate. As per Global Climate Report for August 2022, the global temperature rose 0.90 °C above the average temperature of 15.6 °C in the 20th century.

In the past few years, many waste materials like soda–lime glass, rice husk, olive husk, optimal Portland cement (OPC) and borogypsum, etc. were incorporated in the manufacturing of structural red bricks. These waste materials reduce the firing temperatures by liquid sintering of bricks. The composition of raw materials is varied by changing the amount of flux in it. Lesser the earthenware, lesser the sintering temperature.

The sintering temperature of typical red bricks ranges from 900°C to 1200°C. By addition of the above mentioned fluxes, it could be reduced to even 500°C. But how is it possible for such a depression in the required temperature? As mentioned above, silica and alumina present in clay melts at 1710 °C and 2072 °C which are very high temperatures and are extremely heat resistant.

It is still very difficult to attain the temperature where they melt. So flux is added to form a mixture of raw materials. The flux melts at lower temperature than silica and alumina hence the batch containing more flux melts at lower temperature than the typical batch.

The incorporation of such materials is a good idea but physical and mechanical properties of the final product could deviate from the respective ASTM Standards. Some waste fluxes like glass flux enhance the physical properties of bricks and can be used for long term investments. On the other side, fluxes like rice husk, sago husk and olive husk seem to reduce the strengthening properties of the bricks as defined by ASTM Standard C62, C373 and C109. The addition of these husks is a debate among engineers and analysts.

This proved to be a nice step in environmental protection by ceramic analysts. What do you think about acquiring a non-polluted environment? Could we ever achieve this kind of environment in future? In my view, We Can! Just by taking the First Step. We may play our roles as individuals and it'll all end up being compounded later.

*My project focuses on trying to isolate new compounds produced by marine invertebrates which can be used to prevent a process in the marine environment known as biofouling.*

**Cover star**

Jessica Gomez

*Chemistry PhD student*

# HOW DOES DAY IN YOUR LIFE LOOK LIKE?

I wear many hats in my PhD. I'm supposed to be a natural products chemist but I also do microbiology work and a little bit of marine biology too. When I'm in the lab, I'm usually trying to isolate new and exciting compounds from marine invertebrates by using a range of chromatographic techniques such as HPLC or silica gel chromatography. I then have to characterise the compounds I have isolated using spectroscopic techniques such as NMR and mass spectrometry. On other days you'll find me running biological assays using marine bacteria to see how the compounds I've isolated can inhibit the growth of these bacteria. Sometimes I supervise undergraduate student projects in the lab and train others on how to use specific techniques or software and I also demonstrate in the undergraduate labs.

# WHAT ARE THE CURRENT UPDATES IN YOUR FIELD AND WHAT IS YOUR RESEARCH PROJECT BASED ON?

My project focuses on trying to isolate new compounds produced by marine invertebrates which can be used to prevent a process in the marine environment known as biofouling. Biofouling refers to the undesirable build up of marine organisms on subsea surfaces which can be very problematic for the maritime industries such as the oil and gas industry and the shipping industry. Marine invertebrates are cool as they often use chemical defences to protect themselves from predators or competitors and so by studying these defence compounds that they produce, we might be able to find new compounds against biofouling.

# HOW WOULD YOU DESCRIBE YOUR PHD EXPERIENCE?

I have really enjoyed my PhD experience. What I have loved most is how every day is different: one day you might be in the lab, another day you might be writing a paper or supervising a new student or teaching in undergraduate labs! I love that I have had the chance to travel to collect my samples on the west coast of Scotland and I even managed to attend an international conference in California which was such an amazing and unforgettable experience. My research project has also been super enjoyable and interesting and I'm really fortunate to have been able to develop so many new skills during my PhD which are going to benefit me in my future career journey.

# ADVICE YOU WOULD LIKE TO GIVE TO ALL THE YOUNG RESEARCHERS OUT THERE?

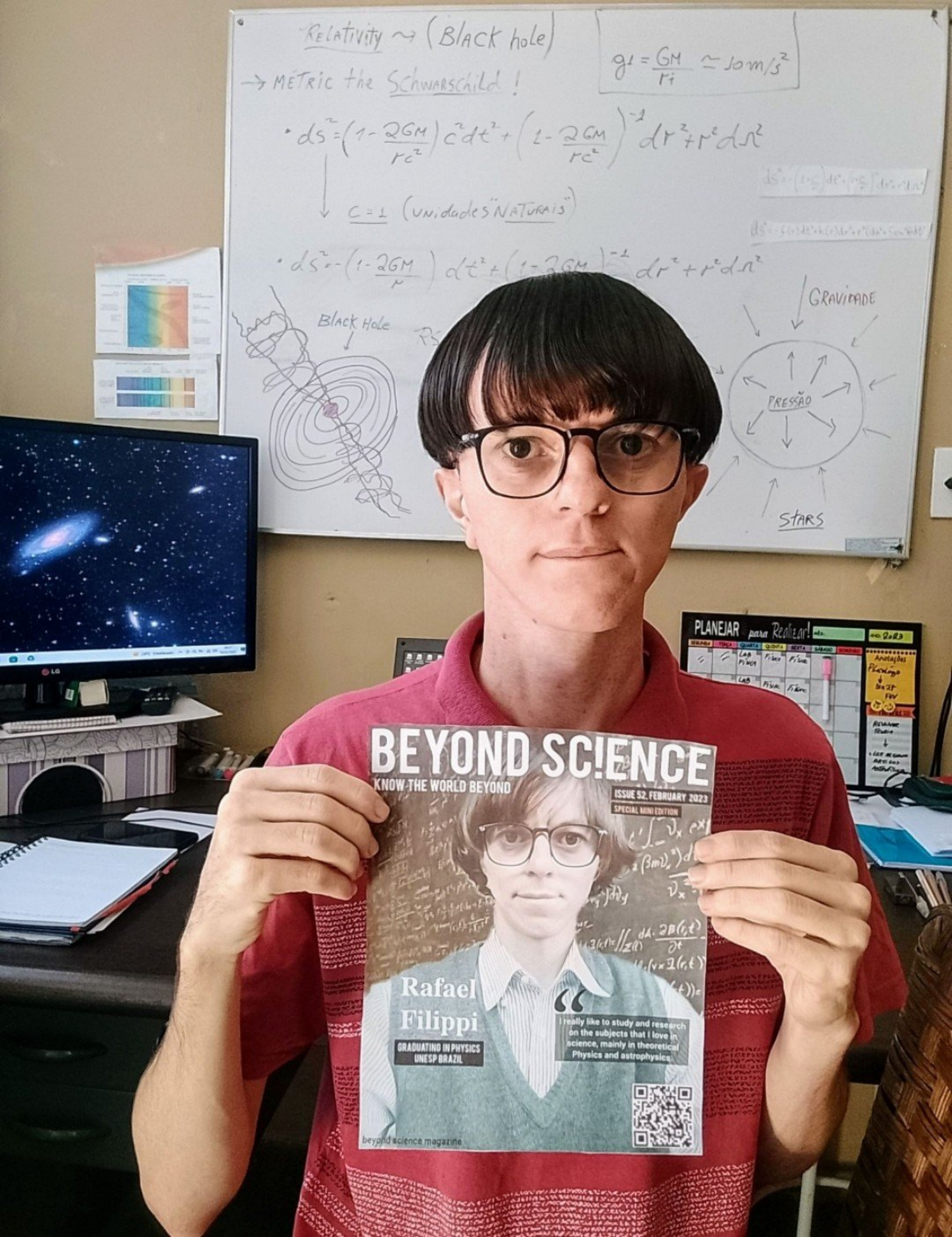
If you are feeling a bit lost at any point, don't worry - it will all make sense eventually. I spent a lot of time early on in my PhD comparing my knowledge and my skills to those who were a lot more senior than me in my lab and it was a really silly thing to do! You aren't expected to know everything already when you begin your PhD. A PhD is a training programme and it is meant for you to learn and develop yourself as a researcher and this will all come in good time. I honestly didn't start to properly believe in myself and my abilities until everything started to come together in my final year so trust me, the imposter syndrome will shift eventually!

**Cover star**

Rafael Filippi

*Physics student, UNESP Brazil*

*My Journey as a Physics student has been really cool, I've been learning amazing things and having a wonderful experience at the University.*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SPECIAL MINI EDITION
Rafael Filippi
GRADUATING IN PHYSICS
UNESP BRAZIL
"I really like to study and research on the subjects that I love in science, mainly in theoretical Physics and astrophysics."
beyond science magazine
Relativity ⇝ (Black hole)
→ METRIC the Schwarschild !
Black Hole
GRAVIDADE
PRESSÃO
STARS
PLANEJAR para Realizar!

# HOW DOES A DAY IN YOUR LIFE LOOK LIKE?

My day is very busy because I study full time at the University, when I get home I continue to work on the Study routine. Where I start to study my scientific initiation about black holes, I really like to study and research on the subjects that I love in science, mainly in theoretical Physics and Astrophysics.

# HOW IS YOUR JOURNEY AS A PHYSICS STUDENT GOING ON?

My Journey as a Physics student has been really cool, I've been learning amazing things and having a wonderful experience at the University. There are many cool things that I like to do at the University, mainly astronomical observation and work on my scientific initiation, these are the best experiences that I am trying for now in the Physics course here at unesp in brazil..

# HOW BEING AUTISTIC AFFECTS YOU? WHAT'S YOUR PERSPECTIVE ON THAT?

Being autistic does not affect me much in terms of socialization, despite my level being light I can do many things alone and be independent in some situations. Autistic brains are different from ordinary people we see our world around us in a different way, each autistic brain is according to the things and subjects they like, each of us has a different kind of ability like thinking in math and science or playing a musical instrument and even having a lot of organization .

# WHAT MESSAGE DO WANT TO LEAVE FOR ALL THE YOUNG LEARNERS OUT THERE?

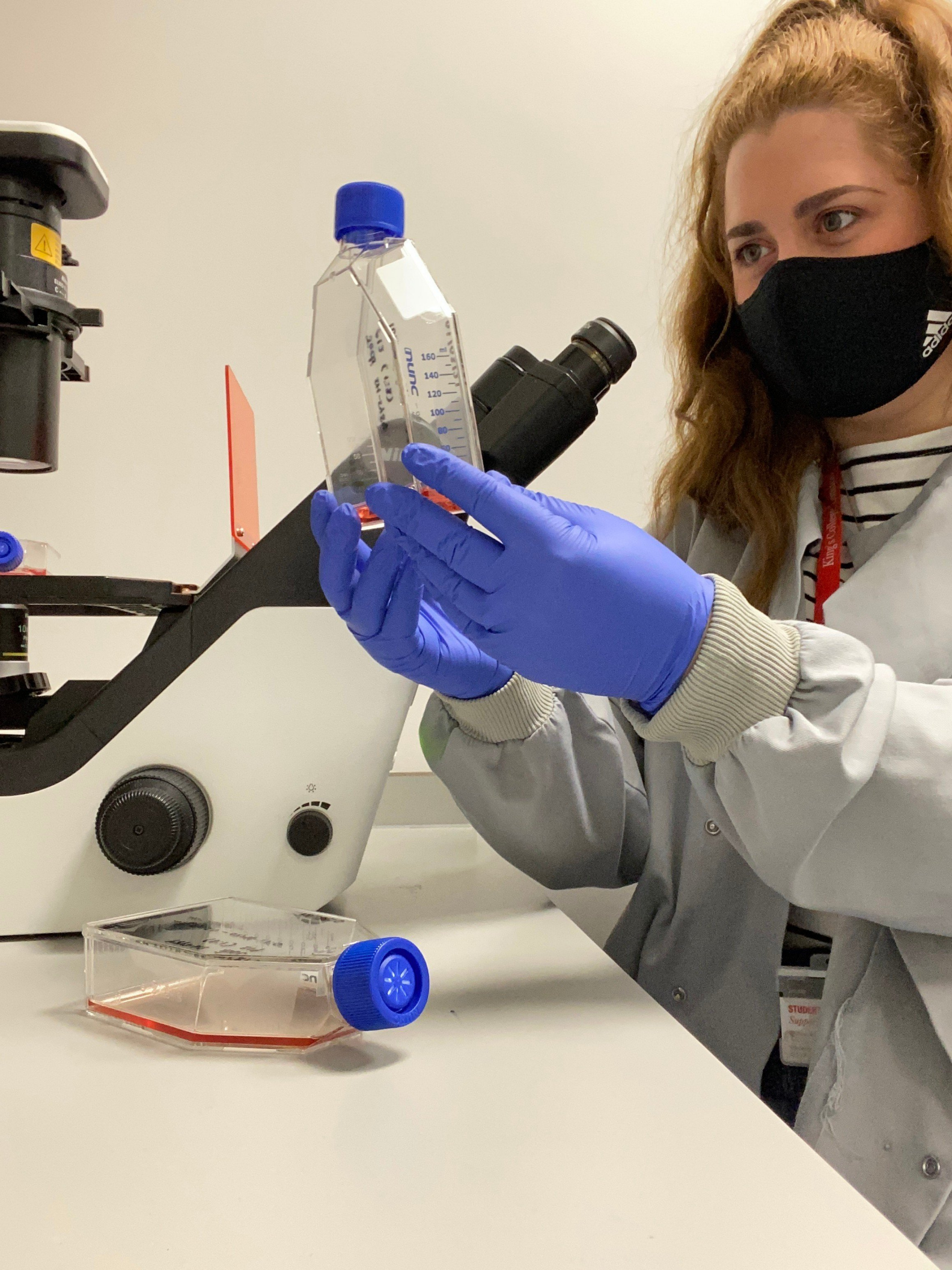
The message I leave for all young people who want to learn or follow the sciences is that they don't give up on their dreams, persist despite the situation of each one of you, if that's what you really want to be a scientist. Doing or studying science is really cool, even more so for those who have a huge passion for studying the universe and trying to understand each of those bright dots at night. Education is the basis of everything to make a better world and better people within society.

**Cover star**

# Jodi Barnard

*Science writer & communicator*


My favourite way to communicate science is with humour, relatability and kindness. Whether that be using the latest reel trend or with inspirational quotes



# HOW DOES A DAY IN YOUR LIFE LOOKS LIKE?

As a wet lab PhD student who also has a part-time role as a Scientific Content Writer for a Life Sciences Marketing company, a typical day in my life is very busy. I like to optimise my time for maximum productivity so mid-protocol in the lab, while something incubates, runs or images I will make sure I make use of the time - writing, analysing or planning.

The usual techniques I use are cell culture, RTqPCR, western blots, ELISAs, vesicle Purification, immunofluorescence or flow cytometry! In my evenings I write for some the biggest names in life sciences - webpages, blogs, publication highlights.

# WHY THERE'S AN INCREASING NECESSITY FOR DOING SCIENCE COMMUNICATION? AND MORE ABOUT YOUR WAY OF SCICOMM?

I personally feel that the pandemic really highlighted the dangers of misinformation. This is when I decided to start my science communication journey. In an era where information is at the fingertips, it's important to know how to fact-check and use reputable sources. But I also saw enough Facebook arguments to know that the mistrust of science, government and "experts" is a barrier. So I started my page as a way to communicate my science research in an accessible and non-patronising way in a space where no question is too simple. Hence "not brain science". What I didn't expect to find was such a large community of other PhD researchers, scientists and communicators and so my page also became a place for socialising, and sharing grad school information that I felt was once gate-kept from me.

My favourite way to communicate science is with humour, relatability and kindness. Whether that be using the latest reel trend or with inspirational quotes - my style of posting has adapted as we transitioned from lockdowns back to busy PhD lab life, and as new opportunities came up which meant that some of my spinning plates needed slowing.

# HOW IS YOU PHD JOURNEY GOING ON? AND CAN PUT MORE LIGHT ON MORE OF YOUR RESEARCH?

I started my PhD in 2020 mid-pandemic without any in-person training or access to expertise. It was hard. In all transparency, in 2022 I almost quit my PhD due to lack of support. But I am grateful to now have some better things in place that will hopefully help me finish my PhD in 2024. My research is at the intersection between autophagy, cell death, and neuron-glia signalling. I am studying a novel cell death mechanism in neurodegeneration, working with extracellular vesicles and microglia.

# FUTURE CHALLENGES YOU CONSIDER IN YOUR FIELD?

I see collaboration and cooperation as the way forward. But in academia sometimes the high impact publications, grants and fear of being scooped can delay or halt progress. The key challenges for dementia research are funding - which in part can be targeted with science communication and education - and a way for knowledge sharing to expand beyond the academics, and finds a way for all scientists to work together to accelerate progress, like we saw with the covid-19 vaccines development.


# BRIDGING CHINESE & WESTERN MEDICINE

**By Anham Abbasi**

I am Anham Shahid Abbasi from Pakistan. I did an undergrad degree in Pharmacy and doing a Ph.D. in Traditional Chinese medicine. I have a living place in the mountain range of Pakistan where individuals generally utilize herbs as medicine to cure ailments. So I was inquisitive from childhood about therapeutic plants. Being the first woman doing a Ph.D. in my town is continuously palatable for me.

Thanks to early explorers like Marco Polo (1254–1324), Materia Medica traveling between East and West for centuries. It is now important for us to harness the traditional medicines from across the globe. Traditional Chinese medicine is a comprehensive system of natural health care that has its roots in the prehistoric religions of Buddhism and Taoism. Chinese herbal medicine are an important component of TCM, along with other holistic practices like acupuncture, cupping therapy, gua sha, massage (tui na), bonesetter (die-da), exercise (qigong), and dietary therapy.

***I want to connect the two extremities of traditional medicine and western medicine by acting as a bridge between the two areas.***

Traditional Chinese medicine (TCM) and Western medicine illustrate the art and science of practice of holistic healing, and how the good practices of quality control, pharmacology and toxicology testing, carefully designed clinical studies, and proper regulation are applicable to medicines. My future plan of study is to how Herbal medicine works? How herbal medicine cure diseases by understanding the approaches of Systems pharmacology and systems biology. This figure is best illustration of that concept.

**Cover star**

## Deb Duhita Mondal

*Mtech biotech & science communicator*

*My goal and vision is to educate and encourage more young students to apply in the field of STEM.*

# HOW DOES A DAY IN YOUR LIFE LOOK LIKE?

I can describe a typical day in my life in many ways as all my days are never the same. My research currently involves wet lab techniques. Most of the days I try to reach lab early morning so that I can have a productive day and complete my work as planned. The techniques I mainly use for my project are basic microbiological techniques and assays. Apart from that being a very keen learner and research enthusiast, I have learnt different molecular biology techniques also which are not a part of my project so far. Some days require only reading, writing and some in-silico works that I prefer always doing from home. I can focus on these more when I work from home and that's a pretty good day in my life.

I have always enjoyed learning biology and always wanted to pursue a career in this field. When Biotechnology happened to me during my undergrad I found how diverse this field is and enjoyed every bit of it. There were times when I lacked confidence, couldn't do well in exams but I have never given up. I tried whatever I had to and put 100% of my efforts. Till date, I am enjoying what I am doing and have no regrets being in this field.

# WHAT ARE THE CHALLENGES YOU FACED DURING YOUR MASTERS AND WHAT ARE THE FUTURE CHALLENGE YOU CONSIDER IN THE FIELD?

I think the main challenge I have faced even before starting my master's is the choice of subject. Biotechnology is like a map that covers many different areas. Since I did my B. Tech in Biotechnology, for my master's I wanted to narrow it down and choose a specific domain of study (Industrial Biotechnology/ Bioprocess Engineering/ Enzymology). But I had no option but to choose what I had in front of me. I started my master's during the lockdown period and because of that we had almost no lab exposure. And I think that's a complete loss being in this field. Practical knowledge is very much important in order to understand and do research. That was a barrier at the beginning. I have been working on my project since 7 months now, firstly I feel that doing literature review, digging dip into a topic and coming up with an idea takes a lot of time. But we are meant to finish our work within a stipulated time of one year.

Secondly after coming up with an idea the execution is a lot harder and the reasons are numerous.
The current challenging aspect in the field of Biotechnology is the limited opportunity for all fresher. Both industry and academia has its perks and its completely fine to listen to your heart while making a decision. But there is a lack of proactive approach and so much misinformation around us. No one really talks about how one can get into an academic position or a job role as a fresher. In this case, networking and negotiation is really important in order to progress in career and it can be anyone from university professors/mentors/scientists/or someone working in the industry.

# WHAT ARE YOUR FUTURE GOALS AND VISION?

My goal and vision is to educate and encourage more young students to apply in the field of STEM. My academic goal is pursue higher studies in my field of interest. I hope to do research and become an expert in my specific field. I have a few domains in mind but have not yet decided what I want to specialize in. My goal currently is to complete the ongoing research works I am doing and collaborate more with people from this field.

# WHAT ADVICE WOULD YOU LIKE TO GIVE TO ALL THE AMATEUR STUDENTS OUT THERE IN IN YOUR FIELD?

My advice to amateur students would be to enjoy the process of learning. Stop comparing yourself to others and that will only lead to self-doubt. Competing with yourself and not with others will make you more confident and proud. This diverse field of Biotechnology can offer you a lot if you are patient, passionate and consistent. I would recommend everyone to plan things ahead of time to avoid any last minute rush. Planning and organizing can make life less complicated. I think reading textbooks can be of so much help and utilize the free resources available on the Internet. Lastly, always listen to you heart.

# CAN YOU TELL MORE ON YOUR RESEARCH WORK AND YOUR EXPERIENCE IN THE BIOTECHNOLOGY FIELD?

I am currently working on my M. Tech dissertation research project. My research domain is Industrial Biotechnology and I am currently working with alpha-amylase enzyme, its production and characterization. I am also trying to incorporate molecular biology and bioinformatics analysis to it. So far I have collected soil samples from various regions and isolated bacteria from it. I have conducted starch hydrolysis test to identify alpha- amylase producing bacteria and performed enzymatic assay to determine the activity of the enzyme. Some more steps on my experiment includes the strain determination, gDNA isolation, Agarose gel electrophoresis, amplification by PCR, sequencing and bioinformatics analysis. Apart from the dissertation, I am currently doing a very interesting in-silico research work which is a side project and related to male contraception. It's fascinating and we might find some useful drug targets as well.

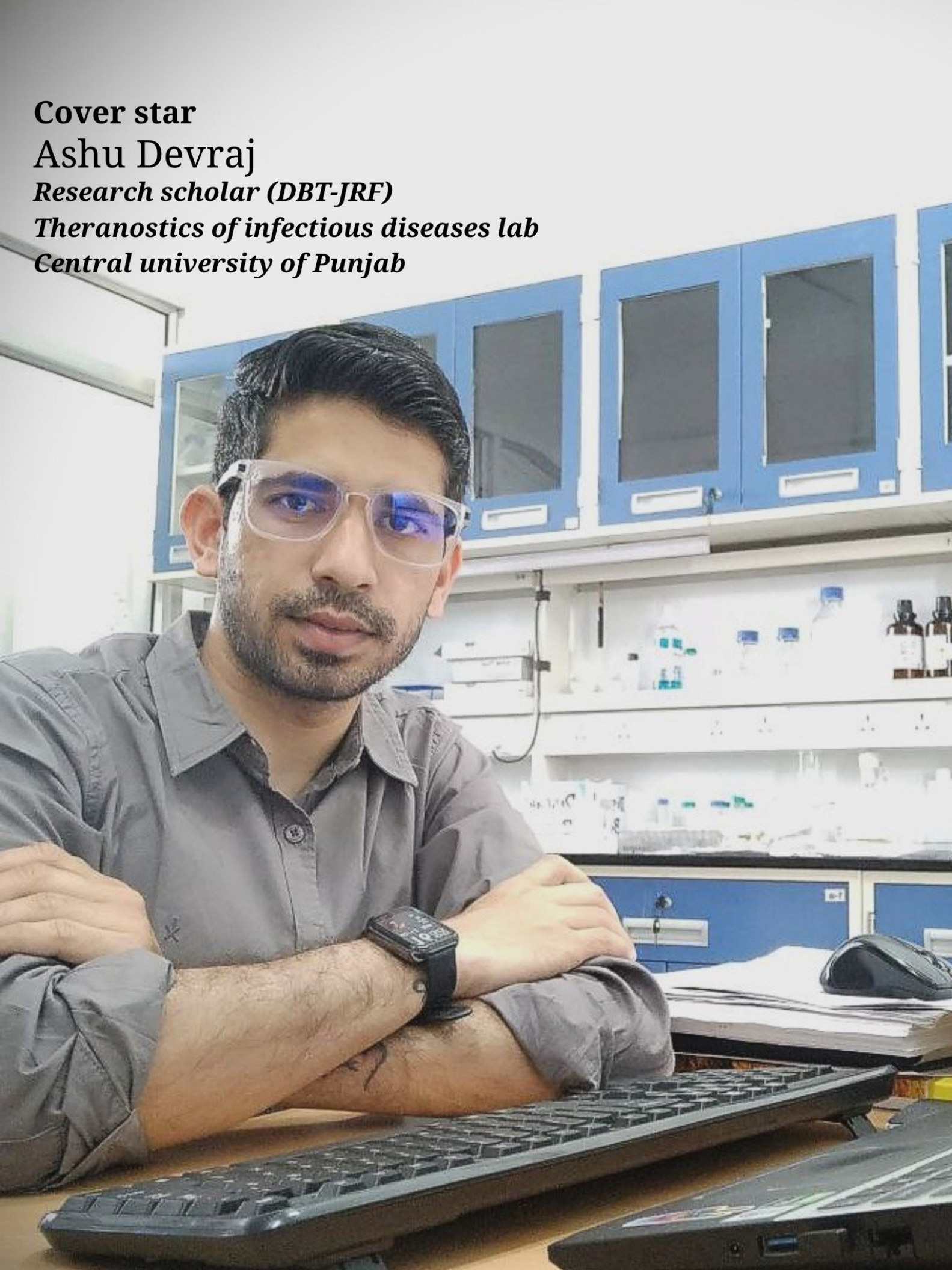
**Cover star**

Ashu Devraj

***Research scholar (DBT-JRF)***

***Theranostics of infectious diseases lab***

***Central university of Punjab***



# HOW DOES A TYPICAL DAY IN YOUR LIFE LOOK?

I generally start my day with a cup of tea because it is the most important thing in my life. I spend much time conducting experiments and researching ideas in the lab. I also assist in supervising Masters's students as they perform laboratory work, ensuring they follow the proper methods.

# COULD YOU TELL MORE ON YOUR RESEARCH OF DRUG RESISTANCE?

Antimicrobial resistance occurs when bacteria, fungi, and other microorganisms learn to resist the medications meant to eradicate them, it implies that the pathogens will survive and grow. Treatment for resistant diseases can be challenging and occasionally unattainable.

Antimicrobial resistance threatens global public health, causing at least 1.27 million fatalities globally and nearly 5 million deaths in 2019.

The hospital, veterinary, and agricultural sectors, as well as individuals at any stage of life, could be impacted by antimicrobial resistance. This makes it one of the most pressing public health problems worldwide. I work on the second most infectious disease (Urinary tract infection). I target drug-resistant UTIs with help of nanotechnology.

# HOW DID YOU START YOUR SCIENCE COMMUNICATION JOURNEY?

I began as doctorate as if science had always attracted. My curiosities to know about scientific reason behind any event, any phenomenon has bonded me with science. When I was in 9th standard, My instructor had always supported me and he had played a crucial role in shaping and developing a scientific mindset. My schooling was completed in a government school. I belong to a rural area in Rajasthan. My village is small, In my village, no was familiar with the advancement in science such as 'What biotechnology is ? and what is research fellow ? And many more such things.

I qualified jrf exam which opened many gateway or we can say opportunities for me to appear in various interviews. Finally, I was selected by the Central University of Punjab for Ph.D program.

In my village, Everyone was familiar with only teaching profession. Being a physically challenged person many suggested me to be teacher for my profession. But I had clear mind set to become the first person from my village to qualify jrf exam and pursue Ph.D. I started studying and I had done my M.sc in Biotech. I also qualified the DBT-JRF exam only in first attempt.

My vision is to help every poor and rural background student in India who has dream to become scientist and doctor, India needs new doctors and scientists with exploratory mind set.

**Cover star**

## Mansi Kalonia

*Brain cancer biologist*

*I am working on decoding DNA repair mechanisms which help in the progression of glioblastoma which is an extremely aggressive form of brain cancer.*


Mate 3000

# HOW DOES A DAY IN YOUR LIFE LOOK LIKE?

Every day is different depending on the experiments that I plan for the day. As a research scholar, I read and plan the experiment before starting and try to manage the timing if other experiments coincide. On days when I am performing the actual experiment, I hardly get time to sit down for a minute. I also take classes for Masters's students once a week. But even on days when my schedule is jam packed, I always take out time for lunch and short breaks to keep myself going. After a hard day's work, I unwind by doing some workouts. Some days can be very productive. On other days when I am not so motivated, if I somehow gather the will and strength to check off half the things on my list, I'd call it a day. Like I said, every day is different.

# CAN TELL MORE ABOUT THE FIELD AND RESEARCH?

I am a cancer biologist working in the laboratory of neuroscience at University of Hyderabad where I am working on decoding DNA repair mechanisms which help in the progression of glioblastoma which is an extremely aggressive form of brain cancer. I have seen the symptoms, side effects, treatments, surgery, life after therapy and everything due to cancer on account of having lost a family member to the disease. My inspiration of working in this area comes from having had a first-hand experience of the impact it can have on one's life. I will try my best to add to the existing knowledge on this disease.

# WHAT ARE OTHER ACTIVITIES YOU INDULGE IN?

I really enjoy outdoor running, weightlifting and bodyweight exercises. Sometimes, I sing and paint to my satisfaction.

# WHAT ADVICE WOULD YOU LIKE TO GIVE TO OTHER YOUNG RESEARCHERS OUT THERE?

I would suggest everyone to work in their field of interest. If not so, the subject, the experiments and the lab would be a burden down the line. In my case, everything seems so tough right now but the topic keeps me connected and sometimes the burden feels lighter. Don't be afraid to ask and discuss things with your seniors.
Keep experimenting and keep shining!

Researchers are the real truthseekers