DEPARTMENT OF METALLURGICAL ENGINEERING AND MATERIAL SCIENCE

DHATUKI

DEPARTMENT NEWSLETTER 2021

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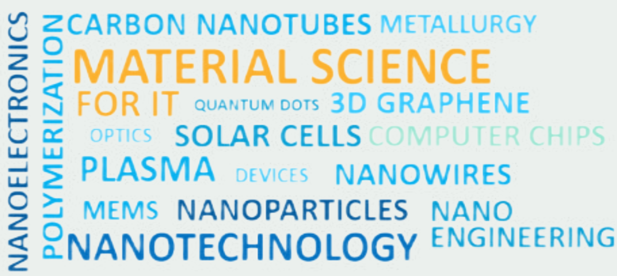
WELCOME !!



What's here to offer?

Let's Start the Journey !!

From the Head of Department's Desk

Professor. K. Narasimhan

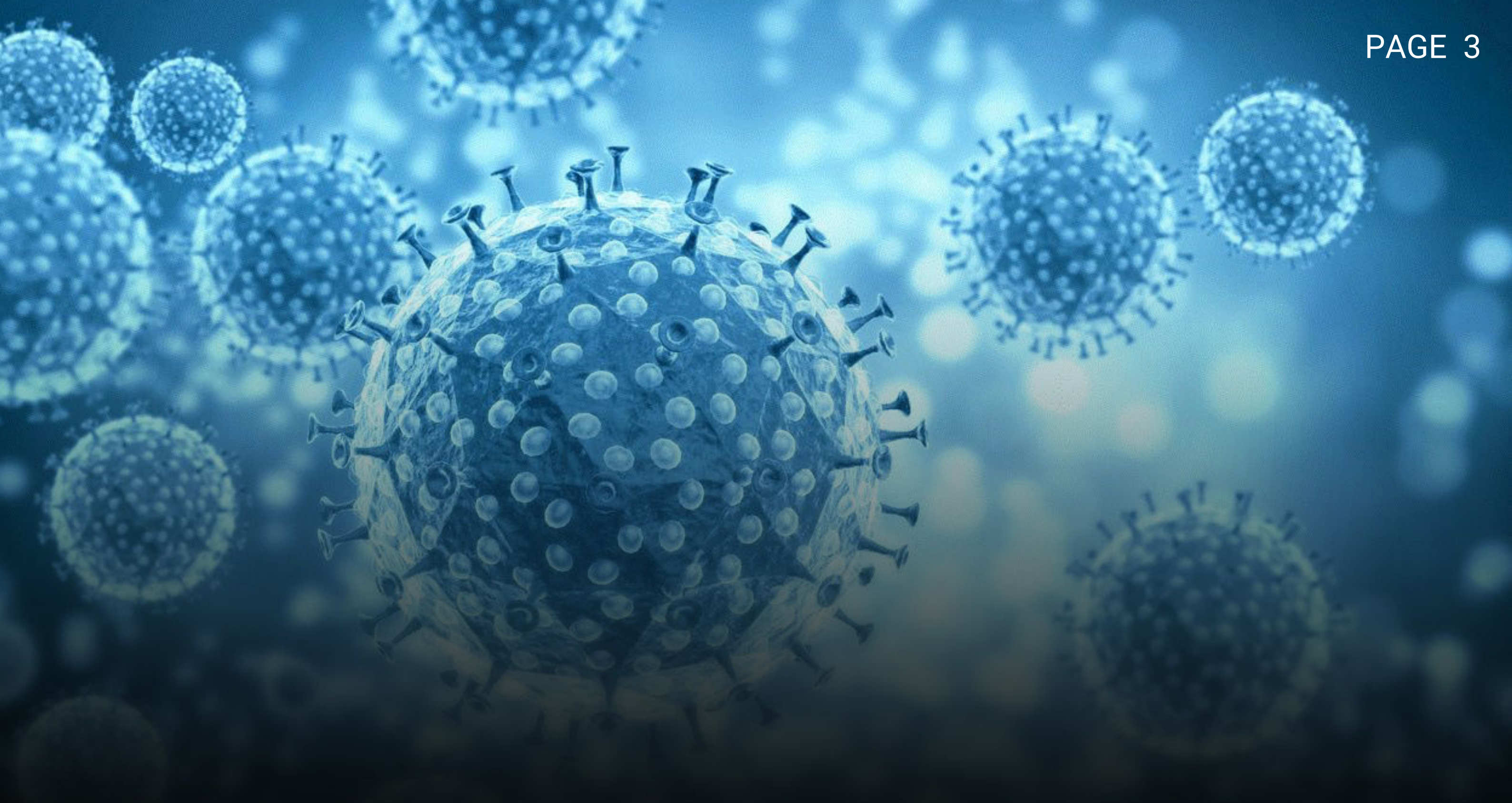
Head of Department of Metallurgical Engineering and Materials Science

It gives me great pleasure to announce that our students have come up with the 10th issue of Dhatuki - The Annual Newsletter of the Department of Metallurgical Engineering and Materials Science.

Being the 10th edition, it shows how constant our efforts have been in promoting materials science and showcasing the work done in the department. This reflects the spirit of the entire publishing team and I am extremely pleased with the quality of the content that has been published. The last one year has been really challenging for all of us, in spite of which our department has kept working and moving forward. This edition takes a look at how materials science has helped in tackling COVID-19 while also showcasing what the future holds.

I am confident that this issue, like the earlier ones, will bring the department and its stakeholders closer. I encourage you all to read this newsletter, enjoy and give your valuable feedback. Despite the challenges of an online semester and working from home, our students have come up with this edition of Dhatuki.

Kudos to the team and congratulations to their great effort !!



Tackling Coronavirus

A Materials Scientist's Perspective

Prathami Kamath
2nd Year U.G

Materials have been of utmost importance to humanity since time immemorial. Materials are probably more significant in our culture than we realize. The field of materials is immense and diverse. Today, the field spreads from the furious flame of the oxygen steelmaking furnace to the quiet cold electrodeposition of copper; from the smallest chip of an electronic device to the largest building made by man; from the common paper bag to the titanium shell of a spaceship; from the clearest glass to the blackest Vantablack; from superconductors to insulators; from milady's stocking to the militant's bomb; from the sweating blacksmith to the cloistered contemplating scholar who once worried about the nature of matter.

Materials by themselves do nothing; yet without materials man can do nothing!

As the contribution of materials science and engineering to other disciplines is rapidly increasing, it has become necessary for scientists of all backgrounds to understand it better. Today, we are in the midst of a materials revolution! We use more materials than ever before, and we use them up faster.

Think of just about any major challenge we will have to face over the next decade and materials are at the center of it. Before 2020 phrases such as “social distancing” and “lock down” were not part of our normal vocabulary; however, it seems now that they are at the core of every conversation.

When India encountered its first case in January, the coronavirus seemed like an abstraction – an unknown infection in a corner of China that seemed to have created a scare of sorts. But it wasn’t “our concern”, until March. Suddenly it wasn’t “someone else’s problem”. Covid-19 had hit home. We, as engineers and scientists naturally look to see where we might be best placed to help as we start to piece together what this new normal means for us. Tackling a problem of the magnitude of a global pandemic cannot be undertaken by a single discipline.

At this point of the crisis, where emergency medical care and reducing pressure on health services are the priority, we look to our clinicians, epidemiologists and experts in the biomedical sciences for frontline solutions. However, we must think more broadly about the role of materials science.

This article highlights the role of materials science in antiviral research and the importance of collaborations across borders and disciplines in addressing the global pandemic caused by SARS-CoV-2.

When Jiaxing Huang, a materials scientist at Northwestern University heard that Wuhan, China, was entering a lockdown to control the spread of the novel coronavirus, he immediately began thinking of ways to contribute to the global response to the impending COVID-19 crisis.

Initially, like everybody else, he was frustrated because drugs and vaccines were not in his scientific wheelhouse. But then he made an astute observation: a virus spends a lot of time in the material world before reaching a human.

“*That’s our territory!*”, Huang says about his research group. “*That’s what we [study] as physical scientists. So, there’s got to be something that we can do about it*”. What these materials scientists decided to do was, try to develop a reusable add-on layer for face coverings that could kill viruses. Huang and his team proposed a sticker-like product that could be added to lower-grade face masks or face coverings that patients can wear.

The proposed product has a complementary chemical barrier to reduce the infectiousness of patients or carriers. The team's hope is that, when an infectious person sneezes or coughs into the mask, the antiviral substances in this add-on layer will interact with the droplets and disrupt the structure of the virus, so even if a few aerosol-sized droplets escape through the mask, they're rendered harmless.

Huang believes that the usefulness of this is not just in a pandemic and that in general, reducing the infectiousness of a patient is a very important and effective way to control and mitigate any infectious disease. Huang's group is not alone. The pandemic has propelled researchers around the globe to work on similar antiviral mask technologies. Their common goal is to build a mask that does not just trap the novel coronavirus, but also destroys it.

These lingering viruses could infect workers who reuse the equipment. To combat that issue during the pandemic, hospitals around the world have been decontaminating masks and other personal protective equipment (*PPE*) before reusing them. As long as the virus is there on the mask it's still active and can infect staff who come in contact with the discarded PPE during it's cleaning and washing.

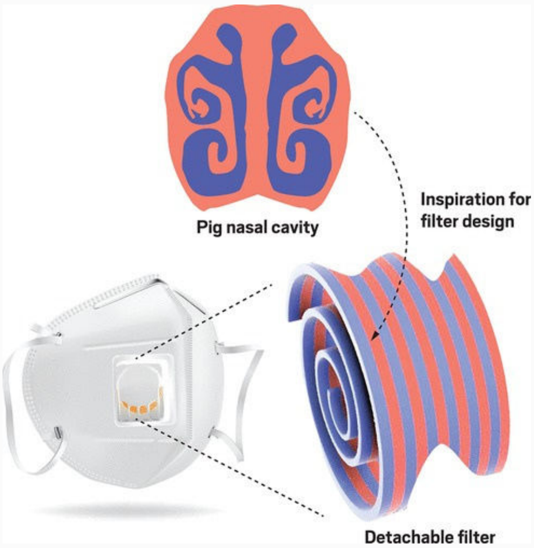
G99+ Masks

But Praveen Vemula, a materials scientist working on antiviral masks called G99+ at the Institute for Stem Cell Science and Regenerative Medicine (*inStem*), an autonomous institute under the Indian Department of Biotechnology, thought that a mask that destroys viruses may be a better option than disinfection.

Vemula along with colleagues harnessed the antimicrobial powers of quaternary ammonium salts to attack the novel coronavirus. These salts are membrane disruptors, which means they could work against all viruses that feature a lipid membrane envelope, like SARS-CoV2. These molecules interact with the membrane and just rip it off.

The salts contain positively charged nitrogen that can interact with negatively charged ions on virus membranes, as well as greasy hydrocarbon tails that can poke into and disrupt the membranes.

Vemula's lab has impregnated cotton fiber with the best-performing quaternary ammonium salt. In lab tests, the treated fabrics kill 99.99% of viruses like SARS-CoV-2 and those that cause influenza on contact. A team of scientists have also taken inspiration from the tortuous nasal passages of animals like pigs to design a detachable filter for masks. These animals' nasal passages excel at trapping droplets to enhance their sense of smell. In a mask filter, these twists and turns could capture droplets containing viral particles, and then copper surfaces could destroy them.



Masks inspired by animal noses that have a better sense of smell than humans

Materials scientists have been hard at work throughout the global pandemic. Materials research provides a natural meeting ground for specialists from various scientific and engineering disciplines. The pressure for such interdisciplinary collaboration will grow in the future.

The challenges of the current world are constantly fueling the materials revolution. COVID-19 might be taxing our systems and taking some very important years of our lives away from us, but it's also building our patience and resilience and allowing us to develop new and innovative solutions out of necessity.

References:

- COVID-19 Pandemic Has Spurred Materials Researchers to Develop Antiviral Masks (acs.org)
- Materials and Man's Needs : Materials Science and Engineering- Volume I, The history, scope, and nature of Materials Science and Engineering.

BIOMIMICRY

The more our world functions like the natural world, the more likely we are to endure on this home that is ours, but not ours alone
-Janine Benyus

-Kedar Bahulkar
Final year D.D U.G

Delve deeply into the enigmatic mysteries of materials or navigate through the fundamental physics underlying the world around us and dramatic discoveries can come to light. Biomimicry is an approach to innovation that advocates borrowing strategies found in nature to develop sustainable solutions to human challenges, encouraging us to think about the broader ecosystem that we are designing for.

DID YOU KNOW?

The aerodynamics of the famous Japanese train was inspired by the shape of a bird's beak

Such curiosity-driven research to unlock nature's mysteries through characterization of materials and investigations of structure property relationships have already begun to envision future integration of life sciences with materials science and engineering, both in the chemistry of materials and the mechanical properties of materials.

Nature comes up with some really fantastic solutions, whether it be an adhesive that works underwater that is inspired by slugs as one example, or even learning how bones are designed to be resilient.

Creating materials that are adaptive and can respond to stress from their surroundings and environment, such as self-healing or repairing themselves is commonplace in nature. Mimicking the spiral-growth principles of the fibers of pine trees to design a new plastic water bottle. This innovation makes it more durable without adding extra weight and reduces the total raw materials used by 7%.

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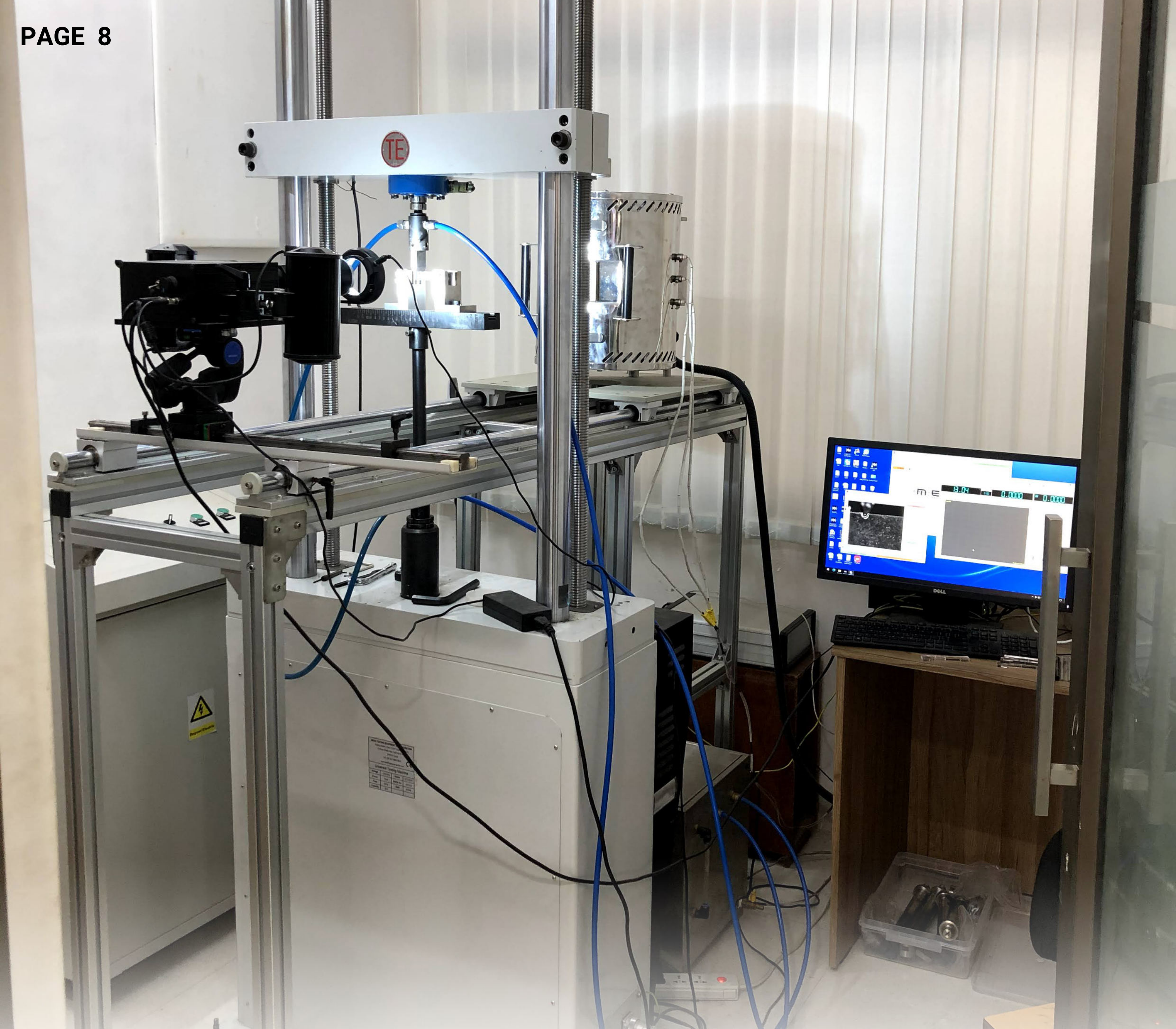


Inside Into the Lab!

A dialogue with professor

Kharanshu Bhojak
2nd Year U.G

Prof . Nagamani Jaya Balila

She heads the **"Micromechanics of Materials"** group in MEMS Department, IIT Bombay. She specializes in the deformation and fracture behavior of materials at small length scales. She has worked as a postdoctoral research scientist at *Max Planck Institut für Eisenforschung GmbH,* Duesseldorf, working with Prof Gerhard Dehm, on the topic of fracture mechanics at the small-scale. She has graduated from the Indian Institute of Science, Bangalore with a Ph.D. thesis titled 'Microscale Fracture Testing of Graded (Pt, Ni)Al Bond Coats'.

Q. What are your current research interests? Could you please provide an overview of the research carried out in your lab?

Our endeavor is to understand material's mechanical behavior at shrinking external and internal length scales to identify cross-over regimes. For this, we develop in-situ micromechanics tools and geometries to test and observe the deformation and fracture micro-mechanisms of materials. Further, we use finite element simulation tools to design interface architectures that can enhance damage tolerance in systems.

Interface dominated materials like multilayer thin films, advanced multi-phase high strength steels processed through severe plastic deformation routes, additively manufactured materials, thermal spray coatings are of particular interest.

Q. How has your experience of being involved in research for a long time been? What according to you are the perks of doing research?

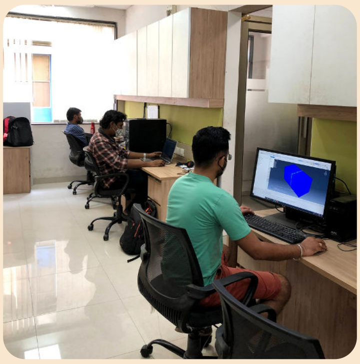
Research is driven by curiosity, either about the natural phenomena that one observes, or a more engineering curiosity about how to make life better by creating solutions to problems. Research requires a lot of toils, patience, and self-discipline. One has to have a keen eye for observation, followed by organisation of thoughts in coming up with a hypothesis, design of experiments to test the hypothesis, conduct of the experiments, proper documentation to record your observation, and finally communicating it to the world.

Either way, it is an extremely fulfilling and joyful experience when you finally see the light at the end of the tunnel. At the back of my mind, I also know that somebody is paying for all this, and hence I find more satisfaction in picking up research problems that are relevant to the society at large, which can fulfill its immediate needs.

The fact that I can think of the problem all day and not feel tired at all at the end of it is a perk. I have never had a day when I felt that I would rather be elsewhere.

Q. How can students and professors of our department contribute in making MEMS more known and understood among college students?

There are so many avenues today. Use social media, make short animations/videos, exhibit your work in national and international arenas, put up a stall in other college techfests, design a mobile van with well-planned and executable experiments that are not resource-intensive and visit schools & colleges, present at conferences, document, disseminate and publicise the department's ongoing research through the alumni network, professional societies, interview teachers and experts in the field to get their perspective and so on.



Q. What are the challenges that one would face in your research field and what approach would you suggest one should have?

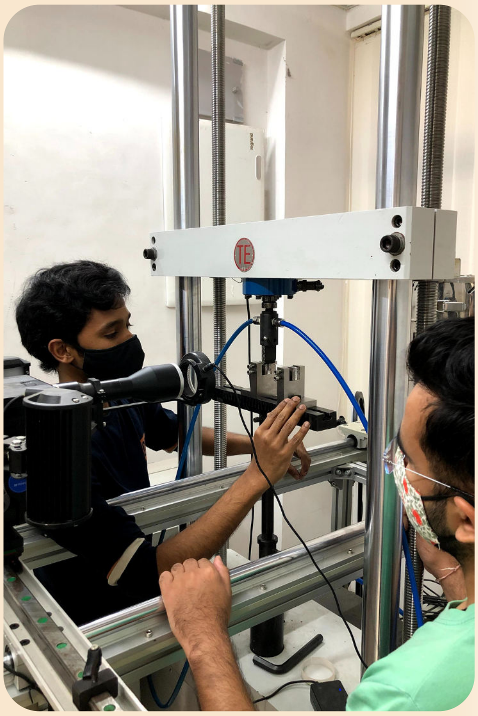
The field of experimental micro-mechanics requires the design of experiments through novel specimen geometries, modeling of these geometries to determine the full-field stress and strain distributions, use of sophisticated in-situ equipment for testing that requires hands-on training, and an ability to extract information and analyse big data to input into a finite element model to finally predict the macroscopic response from micro-mechanical data.

Several interesting questions are being addressed and strange phenomena being discovered in materials at shrinking dimensions through small-scale specimen testing that is in need of further understanding and explanation. For example, how is it that a porous ceramic structure is more damage tolerant than a dense one? Or why does ceramic in thin-film form become less brittle while a metallic thin film becomes less ductile and more strong compared to its bulk counterpart? Can we use these phenomena to engineer better architectures to achieve stronger and tougher material structures? A student who wants to pursue this should be interested in mathematical modeling, have a feel for mechanics, be good with hands and also possess creativity.

It is a challenging field to pursue, especially with limited resources but can be extremely satisfying when you are able to answer pertinent questions and observe unique phenomena and the breakdown of the certain accepted response of materials at the micron and nanolength scales. Most important of all is to have a positive attitude though.

Q. What are the various facilities and equipments available in your lab?

We currently have a high temperature enabled micro-UTM that can be used to determine the mechanical behaviour of any material up to 5kN loads, temperatures of 800°C, cyclic loading up to 10Hz, and also map the full-field strain using an optical camera connected to a digital image correlation software.



We also have the usual sample preparation facilities like grinding and polishing, a low-speed saw, a spin coater, and a fume hood. In addition, since we do quite a bit of numerical modeling, we have 4 workstations that can be used for running sufficiently large-scale simulations.

We use other facilities like the nanoindenter, the dual-beam focused ion beam, the scanning electron microscope, the transmission electron microscope, both with in-situ mechanical stages, the atomic force microscope, and the x-ray diffraction as well as tomography facilities, which are institute or department facilities.

Q. How can students avail these opportunities at your lab?

Students interested in doing research in our group can join the group as interns, or do BTPs, DDPs, MTPs, PhDs, post-docs, and so on. I prefer that students should have completed their 4th semester in MEMS or Mech or Aerospace Eng. for projects since they need to have a basic understanding of the area before venturing into the same. They also must be sincere and committed and willing to put in the required amount of time. They must be willing to work with others since there is no research that happens in isolation anymore. Others who want to avail facilities can do so on a payment basis since equipment needs consumables and maintenance.

Q. What do you think is the motivation for students to experience research in our department?

Materials-related challenges are at the forefront of limitations to realising several engineering technologies. The physical laws, the thermodynamics as well as flow rules are all in place but to put it all in action, one needs suitable materials. For e.g., superconductivity was at one point touted as the next big thing that would make frictionless transport possible, but we are yet to find room temperature (or high T_c) superconducting materials to materialise the dream of maglevtrains. Super strong graphene was supposed to help us make elevators to space and is yet to be realised. Counterintuitive discoveries of smaller are stronger broke down our conventional understanding of materials behaviour and throw new challenges to device miniaturisation. Hypersonic aircrafts that are supposed to reduce flying times to a matter of seconds are waiting for new materials that can sustain loads at 3000°C and still won't creep.

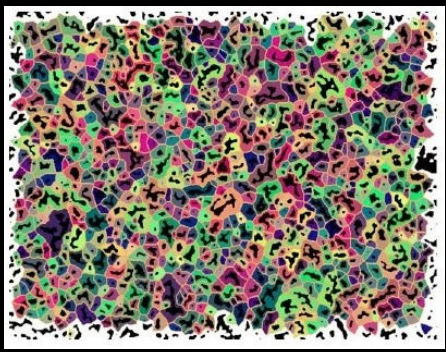
We are also facing a severe resource crunch as a planet. Most wars were earlier fought for oil, but today it is for minerals and rare-earths that feed the semiconductor and other hi-tech industries. We need to actively look for sustainable solutions to repair, recycle and reuse the materials we have and this cannot happen without research, whether it is strategic or civilian applications. And the best place to start would be the department that you have all got an opportunity to join.

The MEMS Department at IITB is unique in the extent of diversity of areas that you can explore and also the integration across these areas, bringing together learnings across several disciplines to be applied. In addition to experiencing the joy of solving challenging problems, there are other peripheral perks, especially if you want to join a core engineering industry or pursue higher education in this area.

Commitment, honesty, and patience are key. If you expect success overnight, this is not the field for you. If you are someone who enjoys solving a problem, then you will never regret being a researcher. I promise there may be challenging days, good days, and bad days but there is never a dull day in research.

Microstructural Fingerprint

Capturing the essence of a material's microstructure



The result of pore boundary tessellation for a partially sintered ceramic. Each cell features a central pore section, colored black and an orange cell boundary

-Kedar Bahulkar
Final Year DD U.G

The mechanical and physical properties of metals and alloys are influenced by their microstructure, and therefore the investigation of microstructure is essential. A microstructural fingerprint is a set of descriptors that encapsulate those features in a microstructural image that result from mesoscale (*i.e larger than nano- and smaller than micro-scale*) structure in a material, and on which properties of the material depend. At its core, materials science is the science and engineering of microstructure. Understanding and analyzing microstructural imagery is one of the important areas of study for a materials scientist.

Over the last century, materials scientists have created a plethora of tools for collecting, analysing and comparing microstructural images, recent advances in data science, including *computer vision* (*CV*) and *machine learning* offer new approaches to extracting information from microstructural images. When a catalogue of intriguing microstructural features is available i.e once we recognize what we're looking for, these tools will accurately segment, calculate, and compare microstructures. With training and experience, a good skill would then be, to know which microstructural traits are most important, which bring out a truly defining feature or property of the sample that will prove to be crucial.

We explore the world of microstructure and find useful characteristics and relationships within and between micrographs without any assumptions about what features may be present. Materials scientists perform a qualitative survey in which the microstructure is observed at increasing magnification from the lowest available, for the imaging technique employed. This results in the identification of all the important microstructural length scales.

Next, transforming the digital interpretation of images across many sectors such as digital recognition in histology (*the study of the microscopic structure of tissues*). The inability to digitally represent a microstructure is a serious obstacle to data storage, interpretation, and exploitation in the life, materials, and earth sciences. While there are databases for some fundamental materials information in thermodynamics and crystallography, there are no commonly used collections for more complex data sets such as microstructure. As the name implies, Microstructure Mining is the application of data mining principles used in many branches of science and engineering to the analysis of material microstructure.

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FROM THE SENIORS

Mrigi Munjal
4th Year B.Tech

Harshita Masand
4th Year B.Tech

Miskin Kumar
B.Tech MEMS
IDDDP CMINDS

Taksh Satra
5th Year Dual Degree

Pratham Patil
5th Year Dual Degree

Neeraj Chandnani
2nd Year U.G

Academic experience of your first year

Mrigi- Common first-year courses were thought-provoking and challenging. I particularly loved the Department Introductory Course, MM152. The instructor's passion for the field captured my imagination and introduced me to the world of materials science and I haven't looked back since.

Harshita- Over my first year, I would say that my academic experience was good. I developed an interest in some of the courses and enjoyed studying them. However, my grades were not very good in the end. But I got some clarity about what I enjoyed doing.

Taksh- First year is actually spent on understanding what is expected in terms of academics. What to study, from where to study, kind of practice and all such things take some time. Also, in the first year focus on acads was relatively less. It's more on exploring the insti, various events, clubs, as well as the hostel life.

Miskin- First year had a lot of ups and downs. The courses cover a wide range of subjects, unlike subsequent years. Coursework tends to be pretty heavy, you hate some and you like some but they end up building the foundations of whatever field you would like to go for in the future. I loved both CS101 and BB101 (*Unlike most*) and the labs were fun (*too much work as compared to labs in later years :P*).
DIC was pretty awesome as it gave a pretty good idea of what was to come in the future. I had a slightly tough time with the MA courses but they were quite thorough and started from scratch. Overall the freshman year was quite informative and made me more incisive about science and engineering from my JEE days.

Pratham- My first year was not so good. I attended very fewer classes and as a result, I did not perform very well in my first year.

Advice for the freshers facing the same dilemma of changing their branch

Mrigi- Don't go after the traditional hierarchy of branches. That's only the first year. Get out of the JEE state of mind. Only pick a branch if you're actually interested. Don't go for the glory. There's no glory in dropping grades and being a mediocrity in a more competitive branch. All departments have the same international reputation if you're eyeing higher education. And if you're not, most non-core companies pay no attention to your department, just your CPI and skill sets.

Taksh- Try to develop a basic idea of what u want to do. Find what actually interests you and plan accordingly. If there's a specific debt you admire and want to work in that field, definitely change your branch. However, if you are planning for a non-core life, to be honest, the department doesn't matter in that case. It's the profile u built by POR and related intern, projects, courses etc. In-fact it is easy to develop such a profile in MEMS dept as we all know it is relatively *chill* dept. Some true facts, MEMS in India is still something new and yet at the stage of developing. So one may face some problems as well as develop a feeling of lack of core opportunities. But there are definitely some (*definitely less but some*) good opportunities u can plan and work for.

Miskin- Forget your notions of what the cutoffs and JEE days tell you of a branch. Talk to the professors and especially your seniors from your parent branch as well as the branch that you are thinking of shifting to. I know a lot of friends regretting their choice of changing their branch. Reach out to people, a lot of them are doing really interesting work at amazing places and get an in-sight into what their workflow is, before deciding.

Harshita- According to me, one should consider changing from MEMS, if they want to get into a particular branch and have interest in the same. Some people change their branch, not to get into a particular branch, but to get out of MEMS and this is probably not the best strategy to follow.

Pratham- The decision to change the branch depends on multiple factors. Everything ranging from interest to curriculum, the chillness of the branch and friends influence the decision. My advice would be to change the branch only if you are genuinely interested in the branch you are choosing. Otherwise, meta is the best branch to keep up with the curriculum and excel in extracurriculars, may it be PoRs, research or anything.

Core v/s Non-Core

Miskin- Don't jump to conclusions too soon on what you like/dislike. I'd say the best way to get to know something is by doing it yourself. So if you're confused about what to choose, try both. Take up a research project under a prof as well as a PoR/company intern in Winters or in sem. You'll get a pretty good flavour of what both have to offer and then pick. If doing all that isn't your style then disturb/ping a bunch of seniors and get to know what they do on a daily basis to understand what each field has to offer. I for one love to work in interdisciplinary research fields and have been working on projects on the interface of CS and Materials Science since then.

Pratham- Core interns for us generally involve a research problem in which your input is valued and your learning is ensured. Doesn't matter if its a university or industry intern. Your mentor will ensure you learn something. In non-core interns, you would be given certain tasks which you need to complete and learn in the process. If you can learn independently and apply that to solve problems, you will thrive in non-core interns.

Taksh - Make a decision as early as possible which would help you plan early. Currently, core definitely lacks opportunity in terms of the number of offers coming in campus. But outside India, there are opportunities that can be planned for. Higher education abroad may definitely help in obtaining them as it helps to explore them. Try not to get influenced by the peer pressure that definitely builds because of non-core guys getting early offers because it will occur. There are many among these who did get very good non-core offers in the beginning but did not love the kind of work they had to do. Do what you actually enjoy!

Harshita - Core vs non-core is an age-old debate and I have also been facing it since forever. Be it the internship period or the placement period. So, just stick to one policy. I have realised that I can switch to non-core later too, but won't be able to get back to the core. So I plan to stick to the core until I start disliking it. I guess it's a good idea to go by method of elimination here XD.

Suggestions for Sophomores !

Mrigi- I interned at Monash University in Australia in my second-year summer. The international experience broadened my horizons and increased my fascination with the world of technology. My personal advice would be to definitely look for some summer research opportunities internationally or on campus, in your second or your third year. Also, contrary to popular belief, having too much research on your resume does not close doors for other unrelated opportunities. Always keep an open mind.

Harshita- It is a good idea to explore research during the second year summers, even if one has more interest in non-core. This is because it is always possible to switch to non-core during third-year internships and placements later, with a research profile. However, vice versa becomes difficult at times. Since we are in an institute highly known for research, it is a good idea to explore it before ruling it out altogether. I think, the liberty to explore that we get as an undergraduate, might not be the same later.

Pratham- Build your CPI. Later you will get too busy to do it. Attend all the classes and do all tuts regularly. Not much is required in our department to score well.

Just do the bare minimum.

Miskin- Maybe you didn't get a branch change or maybe you did, don't get bummed out. The institute has a lot to offer for everyone. This is the year to explore your interests and decide what you like. Reach out to professors for research projects, take up a PoR at some club that galvanizes you, go try out all the sports (*if not in the pandemic*), apply for a university intern, take up ALCs etc. Even if you don't figure out what you like at the end, you will have a pretty good idea of what you don't like and that's equally good. Reach out to as many seniors as you can to get fundaes (*especially courses and occasionally life xD*) and to get an idea of what people are working on. Their advice can not only help you but you can probably even avoid their mistakes.

Taksh- Getting a core intern in second year through placement cell is something very rare. The way would be through either your own contacts or through actually applying to some of the profs/companies for the same. An easier way could be to start working on a project at our dept under some professor and later asking him whether he/she could help in any way. Our profs help us refer to some good opportunities out there. Important is to find such a professor and then actually sincerely work with him/her so that he/she is impressed and willing to help you.

Internship Experience in Core

Miskin- In my 2nd year summers, I interned at NYU where my work was on Machine Learning and Simulations. In my 3rd year, I interned at Sony, Japan on DFT and Computational Prediction of New Materials. In a university intern, the focus is purely on science and research whereas in a company internship economies of scale not only play a major role but that is what drives the industry forward. In a university intern, you mostly work on your own and report to the professor or a postdoc whereas you coordinate with a team at a company. If you are planning on pursuing an MS/PhD then a university internship is way more helpful as it gives you a first-hand experience of what it would be like. Both provide quite different but necessary experiences.

Taksh- I completed my internship at NTU. It was a beautiful time I spend there. Got to work in a clean-room on LED devices. Used to attend their meetings and even interacted with people out there. Apart from there, roaming and exploring the country was fun.

Pratham- My intern at Applied Materials was one of the highlights of my insti life. I got to work on multiple projects which actually involved research and I learnt many different things there. I learnt how to do research in materials science and the mentors guided me through every step.

MATERIALS SIG!

In April last year, we formed an informal group to foster organic discussions around the frontiers of Materials Science and Engineering. We call it "*something to do with materials **SIG** (special interest group)*."

Since then, the group has grown to 70+ undergraduate students from all years and some students from other departments as well. We use the SIG to exchange some interesting readings and videos.

Weekly discussions on Materials Science and its applications

Open for all years of study and Departments

Li ion Batteries -- LEDs -- Perovskite Solar cells -- Aerogels -- Polymer in Crocs Shoes -- Materials for Mars Colonization and Asteroid Mining -- Graphene -- Supply chain of Si -- Materials for Hydrogen Storage --Recycling of Polymers -- Piezoelectric Materials --Additive Manufacturing -- Materials for COVID-19 -- Environmental Impact Assessment -- Glass -- Memory/storage devices -- Carbon Capture and Storage -- Warm Clothing for Armed Forces -- Satellite Structural Material -- Materials for Megacities -- Metamaterials -- National Steel Policy

May onwards, we started hopping on a call every weekend to hold a group discussion on a pre-decided topic. We have met every week since then and discussed topics ranging from piezoelectric materials to glass technology and even offbeat topics like asteroid/Mars mining and the polymer Croslite which is used to make Crocs footwear.

The idea is to not cover a lot of depth but just to appreciate the endless possibilities. If you're interested, we look forward to welcoming you aboard!

Join us on facebook Messenger

Ping Rohit Yadav on Facebook to get added

JOURNEY SO FAR

Publishing our 10th edition of Dhatuki.

With a strong commitment for the world of Materials science, we have came a long way. Our yearly newsletter has inspired many, and we believe to continue the same in future.

Over the Years

35+ Articles || 12+ Interviews || 200+ Pages
15 Years of Dedication

Committed for the love of materials science

Link below will direct you to all the previous Dhatukis
https://www.iitb.ac.in/mems/en/activities/dhatuki

END NOTE

Ankit Sanap
Department General Secretary
MEMS, IIT-B | 2020-21

Dear Reader,

With great pleasure, we presented the much-awaited tenth issue of the department newsletter Dhatuki. In this edition of Dhatuki, we tried to acquaint readers with the developments in the MEMS field in our department and the world right now. Our department's seniors have responded to some debatable FAQs and had valuable suggestions for juniors, and I would like to thank them for their sincere efforts.

The Department of Metallurgical Engg and Materials Science is one of the oldest and biggest departments of IIT Bombay. Over the years, we as a department have developed in different spheres like academics, research, entrepreneurship opportunities. Currently, our department has top-tier faculty members along with excellent lab facilities, I hope that students will employ this opportunity in the upcoming years for better productivity. My advice to juniors is to think beyond the CPI aspect; academics has much more to offer than some cumulative number, this will reward you in the long run.

I want to thank our HoD, Prof. K. Narasimhan, for his constructive inputs, enthusiastic nature, and supportive administration, which helped our team to publish Dhatuki. MEMS Department Research Coordinator Hrithik, along with the Editorial team: Vinayak, Prathami, Kedar, Neeraj, Kharanshu, have successfully published the edition in time. The editorial team's efforts and resolution are highly appreciable; I want to thank and congratulate them for the smooth conduct of this year's Dhatuki edition. I also urge the readers to provide some constructive feedback to the Editorial Board to make future issues more engaging and informative.

I hope everyone enjoyed reading this edition. Thank you!

Editorial Board

Hope you had a fun read!

The newsletter is the result of our editorial team's yearlong effort, who left no stone unturned to deliver quality content.

We would like to thank all the students and faculties who have helped us in preparing this edition of Dhatuki.

So let's Meet the team behind this edition:

Kedar Bahulkar	Dual Degree U.G
Hrithik Agrawal	Third Year U.G
Kharanshu Bhojak	Second Year U.G
Neeraj Chandnani	Second Year U.G
Prathami Kamath	Second Year U.G
Vinayak Saxena	Second Year U.G

THANK YOU

DEPARTMENT OF METALLURGICAL ENGINEERING AND MATERIAL SCIENCE

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