

Formerly Pandit Deendayal Petroleum University (PDPU)

**NEWSLETTER OF THE DEPARTMENT OF CHEMISTRY, SOT, PDEU**



## EDITORIAL TEAM

### FACULTY COORDINATORS



**Dr. Rama Gaur   Dr. Nandini Mukherjee   Dr. Anu Manhas   Dr. Megha Balha**

### STUDENT CO-ORDINATORS



**Ms. Bhooma**



**Mr. Nikunj**



**Ms. Jeny**



**Mr. Jay Parsana**



**Ms. Meshwa**



**Ms. Shikha**



**Ms. Aarya**



**Mr. Rohit**



**Mr. Aaryan**

### STAFF CO-ORDINATOR



**Ms. Hiral Prjapati**



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## FROM EDITORS' DESK

*From the inception of the newsletter to the students coming back to the campus, celebrating International Women's day in the department and looking forward to the festival of colours towards the end of the month. Here are the editors reflecting on the journey in the first quarter of the year 2021.*

### ***The Inception of the Newsletter***

*Dear Colleagues and Students,*

*Welcome to the first issue of the official newsletter of Department of Chemistry. When the Head of the department proposed the idea of having a departmental newsletter, the thought that flashed in my mind was how would the newsletter look like? Will it be a conventional newsletter talking about the events and activities of a department or will it be different? The inception of the newsletter would have been incomplete without the participation of students and faculty members.*

*CHEMSTREET is more than a newsletter, it is an attempt to showcase all the achievement of the faculties and students. The idea is to pave the road to the successful journey and celebrate the journey of all the members of the department. I would like to mention a special thanks to Prof. Rajib Bandyopadhyay to provide us with opportunity to showcase our department at University front. Thanks to the Director General, and Director SOT for gracing the first issue with their words of wisdom and applaud for the editorial team for their consistent great efforts. It's just the beginning, there is a long journey to take.*



***Dr. Rama Gaur***

### ***Back to Campus***

*Dear Colleagues and Students,*



*Welcome to CHEMSTREET! When we were doing the groundwork to bring CHEMSTREET to life, we were also experiencing a much welcome shift of getting back to the campus. Although we are not quite past the challenges the pandemic brought last year, most of us wanted to be back to the University, and gladly, we are. It's so heartening to see many of our students back in the classroom and feel their vibrant energy in the campus. On February 20th, we had an informal on-campus reunion of faculties and senior year students of our department to warm up to the campus life again, while following every safety protocol. Songs were sung as part of an Antakshari. The joy of the non-virtual interaction with their fellow-mates and teachers was showing up in their eyes. Life during a pandemic is not easy, yet I am sure that the journey our department, our university is going to undertake will be worth every challenge. The first issue of CHEMSTREET reflects the exciting uphill path already travelled. We look forward to the 2nd quarter of 2021 and hope to connect with all through CHEMSTREET.*

***Dr. Nandini Mukherjee***



## ***Celebration of International Women's Day***

*Dear Reader,*

*The launch of chemistry department's first newsletter "CHEMSTREET" during the month of March gave me a big push to write on the International women's day. On 8<sup>th</sup> of March, 2021 we had organized a webinar on "The She of the Science World" having speakers from various backgrounds with their versatile ideas regarding the present scenario and women's participation in it. So, let's have a walk down the boulevard of science with the Madam Curie's famous inspirational enumeration "You can't hope to build a better world without improving the individuals". From becoming the first female Physician of South Asia (Kadambini Basu) or to be the first to initiate the field of Microwave Engineering in the early 90's (Rajeshwari Chatterjee), to, to be the first Indian woman ever in space (Kalpana Chawla) or achieving the prestigious Nobel prize in the science-related field since 1895 (no. more than 15 till 2020)- so on and so forth, women are playing a pivotal role in the advancement of mankind by inculcating the rational seeds through their path-breaking contributions and it'll get amplified gigantically in the upcoming times for sure. Just give her a pen prior to anything because pen is mightier than the sword and she can use both inextricably.*



***Dr. Anu Manhas***

## ***Festival of Colors***

*Dear Reader,*

*Warm Greetings!!*



*The month of March not only bids farewell to winters and heralds the onset of spring but also brings the festival of colors Holi. Holi is an occasion for self-reflection, renewing bonds, and celebrating life. It is a festival which brings people together. Making of our Chemistry department Newsletter, "CHEMSTREET" has made me realize the same thing. It aims to bring our whole department together. Being the editor of "CHEMSTREET" gives me the opportunity to know the Chemistry*

*Department a little more and explore the different spheres of student life. Let us hope this festival of color brings more recognition, success, and achievement in credit to our department. I hope you all enjoy the first issue of Newsletter and that some feel inspired to contribute to the next.*

*Wish you all a very Happy, colorful, and safe Holi.*

***Dr. Megha Balha***



## MESSAGE FROM PATRONS

*Dear Colleagues and Students,*

*It gives me immense joy to see and share the first issue of Chemistry Department quarterly newsletter “**CHEMSTREET**”. The Department of Chemistry, which works under the School of Technology, Pandit Deendayal Energy University, has been a part of Department of Science since 2010. It is in the year 2020 that Chemistry Dept. came to its individual existence, as Dept. of Science was bifurcated into Dept. of Physics and Dept. of Chemistry. The first issue of CHEMSTREET will give you glimpses of the activities and achievements the department has been able to bring about even during the tough time of the pandemic. CHEMSTREET has been a pleasant surprise to me in terms of students’ contribution as well. It’s heartening to find out their creativity getting a platform and making CHEMSTREET more than a newsletter. I congratulate all the dedicated faculties, staff and students for their contribution towards the departmental progress. I appreciate the hard work the editorial team has put to publish this newsletter. I look forward to see the Department rising above all the challenges and reaching even higher level of excellence in teaching-learning, research and co-curricular activities in the year 2021. I wish the reader an enriching walk across CHEMSTREET.*



**Dr. S. Sundar Mahoharan, Director General, PDEU**

*Dear Colleagues and Students,*



*Sustainable Chemistry – Green Chemistry encapsulates the future development trends to achieve more intelligent & sustainable lifestyle. As we @PDEU, embark on this journey to towards Sustainable Chemistry – Green Chemistry, I am happy to introduce the first issue of the newsletter which not only share with all its readers the latest news and developments in the Department of Chemistry but would also be sensitizing all of us on the latest trends and developments in the field of Green Chemistry.*

*The limitless power of technology to do good for the sustainable development of the planet and the conviction of my faculty colleagues and students that the golden age is ahead of us - and not behind us – brings about the best in all of us which is reflected in their achievements.*

*Compliments to the editorial team for their passion for perfection and unbound creativity which makes me look forward to the next edition of the newsletter.*

**Prof. Sunil Khanna, Director, School of Technology, PDEU**



*Dear Colleagues and Students,*

*I am extremely jubilant to share the first newsletter of the Chemistry Department – **CHEMSTREET**, an outcome of a joint effort by the departmental students, staff, and faculty members. Department of Chemistry, bifurcated recently from the erstwhile Science Department, boasts excellent infrastructure, state-of-the-art laboratory, and faculty members with versatile experience in teaching and research. Our vision is focused on graduating admitted students as life-long learners and leaders in the diverse Chemistry programs. This newsletter encompasses departmental activities covering a wide area of interests that would engross the readers. I would like to congratulate the editorial team comprising four young and enthusiastic lady faculties, who have given their heart and soul for publishing this first issue.*



**Prof. Rajib Bandyopadhyay, Head, Department of Chemistry, SOT, PDEU**



# INTRODUCTION TO CHEMISTRY DEPARTMENT

The Chemistry department works under the School of Technology, which focuses on technological education, research, and service that anticipates and meets the need of tomorrow's world. Initially, the Department of Science was established in the year 2010, comprising Chemistry and Physics disciplines. The departments were bifurcated into an individual department in the year 2020 and were named department of Chemistry and Department of Physics, respectively. The department of chemistry is progressing overtime, indulging in various research activities, symposiums, conferences, etc., to create its impact in academia and industrial areas.

The programs offered by the department are Bachelors of Science (Hons.), Masters of Science, and Ph.D.

## OUR VISION

“The Department has a vision to graduate admitted students as life-long learners and leaders in the diverse Chemistry programs.”

## OUR MISSION

The Department of Chemistry of the School of Technology offers well-designed program curricula to provide in-depth knowledge related to the application of Chemical Sciences and inculcate scientific temper to students interested in Engineering and Technology.

In order to contribute and to provide assistance to PDEU to achieve its mission of academic excellence, the program integrates a judiciously-designed comprehensive curriculum and a research module for the sound academic, professional, and personal development of students.





## RESEARCH LABORATORY

The department laboratory is well equipped with facilities to conduct research activities. The department supports research projects which focus on areas like waste water treatment, solar cells, sensing devices, etc. The zeal of students and faculties leads to the development of innovative ideas. Different groups work in collaboration to amplify the impact of research in the community.



## INTRODUCTION TO FACULTY AND STAFF



**Dr. Rajib Bandyopadhyay**  
Ph.D. NCL Pune



**Dr Manoj Kumar Pandey**  
Ph.D. IIT Kanpur



**Dr Anirban Das**  
Ph.D. PRL, Ahmedabad



**Dr. Nitin Chaudhari**  
Ph.D. Korea University



**Dr Tapan Kumar Pal**  
Ph.D. IIT Kanpur



**Dr Balanagulu Busupalli**  
Ph.D. NCL Pune



**Dr Ranjan Kumar Pati**  
Ph.D. IIT Kharagpur



**Dr Kalisadhan Mukherjee**  
Ph.D. IIT Kharagpur



**Dr. Rama Gaur**  
Ph.D. IIT Roorkee



**Dr Prakash Chandra**  
Ph.D. NCL Pune



**Dr Syed Shahabuddin**  
Ph.D. Univ. of Malaya



**Dr. Nandini Mukherjee**  
Ph.D. IISc, Bangalore



**Dr. Anu Manhas**  
Ph.D. Central Univ. Guj



**Dr. Megha Balha**  
Ph.D. IIT Guwahati



**Dr. Vasudev Trivedi**  
Ph.D. NCL Pune



## Life of a Synthetic Chemist: Current Trends and Future Prospects

-Dr. Prakash Chandra

### Introduction

According to the American Chemical Society (ACS), **"Everything you hear, see, smell, taste, and touch involve chemistry and chemicals (matter)."** Chemicals are omnipresent because all the existing matter in the universe can be fragmented to form chemical building blocks. Therefore, chemical sciences can be highly regarded as the central science providing a fundamental understanding of both basic and applied sciences. Chemistry explains aspects of plant chemistry, geology, atmosphere chemistry, soil chemistry, the chemistry of the universe (Cosmo-chemistry), pharmacology, medicinal chemistry and forensics. With such an adverse range of topics, chemistry always has attracted the attention of young researchers like me to pursue a career in synthetic chemistry. After completing the bachelors, several students are in a dilemma to opt for chemistry as the major specialization subject. I have also gone through a similar dilemma; I was fascinated as well as discombobulated to opt for chemistry in masters. But, I endeared chemistry from the deep of my heart and was conscious of the challenges ahead.

### Opportunities for a synthetic chemist

When challenges come, opportunities also come simultaneously. There are several Indian universities offering bachelors, masters and doctoral programmes in chemicals sciences like IITs, IIISERs, NITs. Apart from these, the Council of Scientific and Industrial Research (CSIR) operates several national laboratories like National Chemical Laboratory (NCL Pune), Indian Institute of Chemical Technology (IICT Hyderabad), Central Salt And Marine Chemicals Research Institute (CSMCR Bhavnagar), Central Drug Research Institute (CDRI Lucknow) which offer PhD courses in chemical sciences. After completing the post-graduation, both industrial and academia seek synthetic chemists with innovative ideas and excellent interpretational skills. The industrial sectors hire synthetic chemists primarily in chemical, medical, food, petroleum, chemicals and production industries. Whereas in the academic sector, they are hired in reputed national institutes for academic and applied research.

Furthermore, CSIR conducts JRF- NET exams nationwide twice a year, casting about talented young chemists and providing a good stipend to research in the field of chemical sciences. Several state-level research fundings are also available for young masters students to conduct their research. The government of Gujarat offers "SHODH" research funding for young masters students.

After completing the PhD work, the research scholar can extend or pursue the research as a post-doctoral research associate (PDRA) in the various reputed national and international laboratories to explore futuristic technologies in the area of synthetic chemistry. At the national level, there are several research funding offered by the government of India as the National Post-doctoral Fellowship (N-PDF), CSIR senior research associate and institute post-doctoral fellowships. There are several international PhD and postdoc research funding available for young chemists. Marie Skłodowska-Curie Postdoctoral Research Fellowships is





**List of several national/international PhD and postdoc research fundings**

S. No.	Fellowship	Funding organization	Qualifications	Application timeline	Age limit	Funding amount
1	UGC-NET Junior Research Fellowship	University Grants Commission (UGC)	Master's degree with at least 55% marks		30 years	Rs. 31,000 per month, for first 2 years and Rs. 35,000 after 2 years + contingent and equipment grants
2	Prime Minister's Research Fellowship (PMRF)	Ministry of Human Resource Development, Government of India	CGPA/CPI of at least 8.0 (on a 10 point scale)/ GATE Qualified	Between March and April	-	Rs. 70,000 per month and research grant of INR 2 Lakh per year for up to 5 years
3	Fulbright Foreign Student Program in USA	USA Government	Master's/Ph.D. Degree Fluency in English is mandatory. A score of no less than 79-80 on the internet based TOEFL is required.	August-September	-	-
4	Vanier Canada Graduate Scholarships (Vanier CGS)	Canadian Government	Ph.D. Scholar	May-September	-	\$ 50,000 per year for three years
5	Australia Research Training Program (RTP) Scholarships	Australian Government	Master's/Ph.D. Degree	April-Oct (annual)	-	\$ 44,674 Australian dollars
6	Swiss Government Excellence Scholarships for Foreign Students	Swiss Government	Ph.D./Postdoctoral Research	Sept-Dec	-	-
7	EDUFI Doctoral Fellowships in Finland	Finnish University	Master's	Rolling (annual)	-	1,500 euros/month
8	JSPS fellowship	Japanese University	Ph.D.	Twice a year August and December		Yen 362,000
9	Marie Skłodowska-Curie Postdoctoral Research Fellowships	European University	Master's with 4 years of research experience or Ph.D.	May-September	-	Fellowship of 4,880 euros per month gross plus 600 euros mobility allowance
10	CSIR-UGC Junior Research Fellowship (JRF)	All National Institutes	Master's with 55% marks	Twice a year May-June and December-January	28 years	Rs. 31,000 per month, for first 2 years and Rs. 35,000 after 2 years + contingent and equipment grants
11.	SERB-National Post-Doctoral Fellowship (N-PDF)	All National Institutes	Master's with 55% marks	May-June	35 years	Fellowship Rs. 55000/- per month
12	SHODH Scholarship Scheme	Education Department, Government of Gujarat				Stipend of Rs. 15,000 per month+ Rs. 20,000 per annum for ancillary expenses





one of the most prestigious fellowships offering post-doctoral funding for synthetic chemists to research reputed European universities. Japan provides a JSPS fellowship to conduct doctoral and post-doctoral research in Japan. Several PhD and post-doctoral research fundings available for chemical science students are listed in the table.

Pandit Deendayal Energy University (PDEU) has excellent infrastructure and highly qualified faculties. The institute is offering B.Sc. (Hons.), M.Sc. and PhD programmes in chemistry. In the master's programmes, several important courses in advanced chemistry like **industrial chemistry**, **analytical chemistry**, **pharmaceutical** and **organic chemistry** are offered. Life as a synthetic chemist is full of challenges and opportunities henceforth; a synthetic chemist has to be innovative, vigilant, and productive. A successful synthetic chemist with good interpersonal skills and a strong capability to fulfil the specified problem is highly desired. Chemists are challenged, excited and satisfied with the profession in which the majority spend their entire careers. On average, a synthetic chemist spends more than half time in the lab to analyse data on a personal computer. Teamwork is necessary for a synthetic chemist to become successful in the field. The workload is further divided and specified into duties like data analysis, modelling, synthesis, research, sales and information management. The general working principles for all synthetic chemists is based on his/her area of specialization, which would be the ability to orchestrate matter and make it more significant to all fields of science and engineering. The synthetic chemist works in close collaboration with other experts in science and engineering, executing problem statements regarding the production, development, and utilization of natural resources inspired by synthetic chemists' discoveries. To become a successful synthetic chemist, teamwork with good interpersonal skills is required; therefore, only being intelligent is not the single factor in becoming a high-quality synthetic chemist. Therefore, a synthetic chemist is of paramount importance and receives considerable attention from scientists and engineers from all walks of life.

### Current status and future prospects

With the increasing population, there is a need for humanity compounding on a quotidian basis; therefore, upgraded techniques are desired to fulfil our aspirations. Problems popping up in the energy, health, environment and food sectors affect our daily lives. Depleting fossil fuel reserves, global climate change, environmental pollution and population explosion pose a serious threat to health, environment and biosphere reserves. A synthetic chemist can contribute significantly to countering environmental pollution by developing advanced materials to sense and counter the pollutants. Furthermore, a synthetic chemist can explore new opportunities for renewable energy and more efficient and benign technologies for energy utilization, consummating the requirements of the growing population. Finally, the synthetic chemist can develop advanced technology for waste management and utilization to produce profitable commodities out of waste.

To conclude, I think it was a smart move to take synthetic chemistry as the major subject for my métier. As a synthetic chemist, I can contribute to more economical and benign chemical production, solve environmental problems, and manage commercial and household waste for efficient, eco-friendly and economical (triple Es) alternatives for sustainable environmental and industrials growth.



## Solid Oxide Fuel Cell (SOFC)

*-Dr. Ranjan Pati*

The current main sources of global energy demand are met by wood, coal, and petroleum fuel. Among others, transportation uses a huge amount of petroleum oil, which leaves a large amount of carbon dioxide and carbon monoxide in the atmosphere. Other than transportation, the industries run with coal and petroleum fuel contribute NO<sub>x</sub> and SO<sub>x</sub> in addition to carbon dioxide and carbon monoxide. This pollution may transform the earth almost non-livable for all the species including human in the coming years. Therefore, it is very much necessary to work on the issue so that energy can be produced without playing with nature to avoid this situation. In recent years, renewable energy plays an important role in generating electrical and heat energy from renewable resources without harming mankind to meet the energy demand up to a certain extend. There are several sources available nowadays, such as hydro, solar, wind, tide, wave, and fuel cell (hydrogen energy). Among those, the fuel cell is one of the most efficient sources of energy so far. There are several different kinds of fuel cells available commercially, such as alkaline fuel cell (AFC), proton exchange membrane fuel cell (PEMFC), direct methanol fuel cell (DMFC), molten carbonate fuel cell (MCFC), phosphoric acid fuel cell (PAFC) and solid oxide fuel cell (SOFC). Some of them are used in the transportation sector, some are used for stationary power generation and some are used as portable power generation devices. In all those fuel cells, one thing is common, which is, all of them use hydrogen as fuel. Since hydrogen is used as fuel, there is absolutely no emission of NO<sub>x</sub> and SO<sub>x</sub> or even CO and CO<sub>2</sub>.

Among all the fuel cells, solid oxide fuel cell (SOFC) is the most efficient one. It can be used in transportation as well as stationary power generation. SOFC is different from other fuel cells as it uses all the solid components. The electrolyte, which is the heart of the fuel cells, is made with doped metal oxides. The most popular electrolyte for making SOFC is yttria-stabilized zirconia (YSZ), even though the ionic conductivity is not so promising, operates at very high temperature (800-1000°C). This high temperature makes the SOFC less durable for long run. Therefore, there is an utmost need of electrolyte materials, which can work at a comparatively lower temperature, without sacrificing the ionic conductivity and so the power density. Ceria based electrolyte materials can fulfil this purpose but the transformation of Ce(IV) to Ce(III) may restrict its use at temperature above 600°C.

At PDEU, our team is extensively working to develop new electrolyte materials (and the process for making them) with improved ionic conductivity suitable for SOFC to operate at low to intermediate temperature.



# Science Journalism: Connecting Science to the general population

-Dr. Rama Gaur



*“Not only is it important to ask questions and find the answers, as a scientist I felt obligated to communicate with the world what we were learning.” — Stephen Hawking*

Science is not merely a subject being taught in the classrooms or lab. But it is a concept for the betterment of humankind. As a Science student, I face challenges to make people understand what I am doing and how I contribute to society? One

- ❖ *What is Science Journalism?*
- ❖ *Need for Science Journalism*
- ❖ *Challenges faced by the Scientist*
- ❖ *Science Journalism as a Solution for all*
- ❖ *Science is for Scientists but Science Journalism is for all.*

morning while having breakfast, I was asked, “Rama, what do you do the whole day in your lab?” Without blinking my eyes, I spontaneously replied I work all day, putting reaction, doing analysis, writing the reports/paper, and a lot of other stuff. “Ohh, you write a paper? Which paper?” (She wondered if I write newspaper) asked my 80-year-old grandma. I was blank as to what to tell her about research. Maa, you won’t understand it.



That one question left me thinking for the rest of the day. I was a Ph.D. student at that time, working hard to earn the highest degree. But I could not explain my work to my grandma. This was not just one person, but out there is a big population who would not understand what a scientist does? How the research improves their life. Most importantly, as stakeholders (taxpayers), they have all the right to understand what is being done in the

name of research.

But the question is how do we as the scientist explain the core research to common/non-science people? The research paper, reviews articles, books, etc., we write, are addressed to the scientific community. The language, terminologies, the content all look black to a common person. The challenge is how do I explain the discovery innovation and research simply and convey it across the general population. Science journalism is an answer to this question.



“Science journalism conveys reporting about science to the public. The field typically involves interactions between scientists, journalists, and the public.”

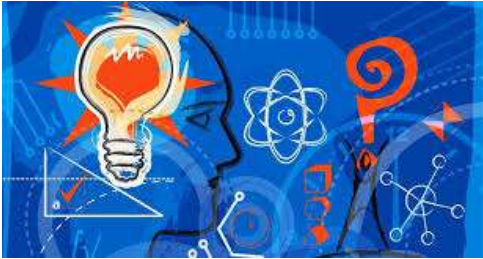


*“Science values detail, precision, the impersonal, the technical, the lasting, facts, numbers and being right. Journalism values brevity, approximation, the personal, the colloquial, the immediate, stories, words and being right now. There are going to be tensions.” — Quentin Cooper, of BBC Radio 4's Material World*

The science journalist connects the two domains by rendering very comprehensive, highly specific, and often jargon-laden information provided by scientists into a form that non-scientists can understand and appreciate while still communicating the information accurately. Science journalists cover some of the most complex



exciting, and important issues of our day, ranging from the impacts of climate change to emerging infectious diseases. They use illustrations and graphics to create fascinating science stories and publish them in newspaper sounds, images, and graphics to create that appear in newspapers and magazines, print and online, radio and TV, and podcasts and videos. The field is undergoing rapid change, which presents both challenges as well as opportunities. The migration of readers and advertising to the internet and digital platforms has led to declining print publication sales. This means that jobs are now scarce in traditional print media but growing opportunities to produce digital content.



We would discuss this in detail about Science Journalism in the next issue. The difference between Science Journalism and scientific communications. The Do's and don'ts of SJ and various opportunities available in this field will be discussed. Till then, I invite the students to come up with fascinating Science stories for the newsletter. A budding writer can be a successful Science journalist in the future. So, let's start with a small step.

**The ABC of Science Journalism will be discussed in the next issue.**

«-----*Science is for Scientists but Science Journalism is for all.*-----»





## Recreational Scissors!!

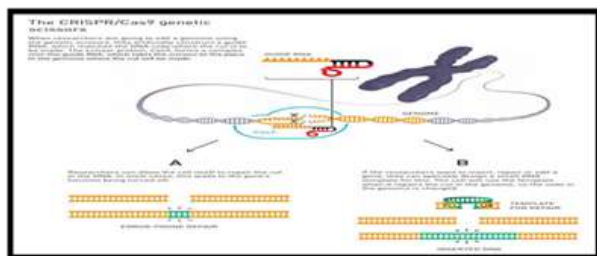
-Meshwa Shah (B.Sc. Sem. 6)

Thanks to modern genomic technology, now just cutting and pasting can increase crop production, fight diseases, and will help in curing genetically inherited diseases. The pioneering works of 'Jennifer Doudna and Emmanuelle Charpentier' in the field of gene technology have resulted in being a modern marvel.



Why is it a marvel? How does this help us? What are things enabled due to it? Why was their work selected for noble prize? The Noble prize was awarded to them for their work on high precision CRISPR/CAS9 scissors. This technology was able to revolutionize molecular life science. Previously, changing the genes in a cell or organism was a lengthy process and almost impossible to get desired results.

The CRISPR stands for clustered regularly short palindromic repeats. During the study of streptococcus bacterium, bacteria were observed to infect millions of people, causing infections such as tonsillitis and impetigo. It also breaks down soft tissues; hence it is also known as a 'flesh eater'. The bacteria showed an array of non-repetitive sequences in between the repetitive sequences. Researchers believe that this non-repetitive sequence of the viruses might have attached the bacteria, and after fighting with these viruses the bacteria added this code in their genome, creating a memory of infection.



Ref: nobelprize.org

In *s.pyogenes*, the mapping helped to recognize the CRISPR sequencing as CAS9, a protein responsible for cleaving the virus DNA. When the tracer-RNA and CRISPR-RNA were fused into a single molecule, a simplified variant of genetic scissors formed named guide RNA. This guide RNA now can guide the CAS9 protein to the desired area

where we want to cleave the DNA strand. After this evolutionary invention, we can now mutate the DNA as we desire. This technology has been used for plant breeding to withstand the harsh climatic conditions and fight the infectious pest, reducing the requirement of using pesticides. The genetic scissors are contributing to new immunotherapies for cancer, and trials are underway to make a dream of curing inherited diseases. Researchers are also developing methods for repairing genes in large organs, such as the brain and muscles. However, the technology needs further refinements before it can be tested on human.

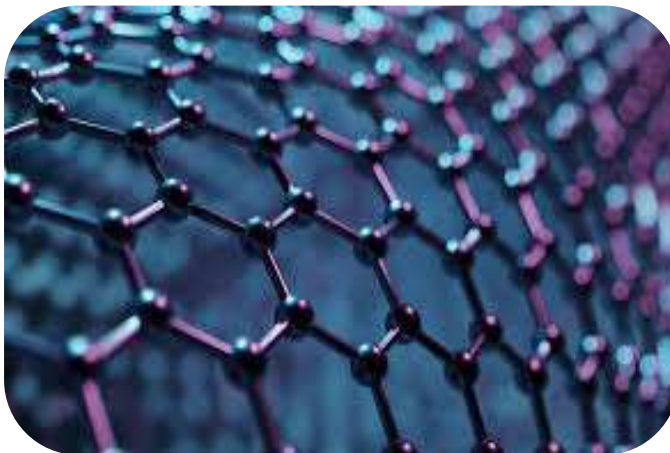
To sum it up, we can say that genetic scissors have opened the doors of curing diseases and have widened our knowledge about the genomic kingdom, which we were unaware of. The bacteria have helped humans a lot, from penicillin antibiotics to the knowledge of genetic scissors. "By passing through the thorny labyrinth, the curious minds always end up with a road leading to a new labyrinth".



## GRAPHENE: The Next Wonder Material

*-Shikha Shah (B.Sc. Sem. 4)*

Scientists have discovered new material that has potential to change our future. It has various applications from flexible solar panels to building components of a spaceship. The futuristic gadgets which seem too far to obtain can be made possible using Graphene for example having a mug which can stream the day's headlines in real time or a cooking pot which can detect the presence of E. coli. It can all come true if we are able to capitalise on this new magical element.



Graphene, since its discovery has garnered hype around it due to its extraordinary properties. It is a manmade element, a million times thinner than human hair, but 200 times stronger than steel with its ability to be a super conductor.

But let us first understand what graphene is. Fundamentally speaking, graphene simply is a single layer of graphite – the material we use to make a pencil. But instead of having a 3D crystalline structure like graphite, graphene is 2D, meaning it's just one atom thick with the atoms arranged in a hexagonal lattice or honeycomb arrangement, looking a bit like chicken wire. The strength of graphene comes from its structure. In graphene, each carbon atom is covalently bonded to three more around it, and it is the strength of this bond that makes graphene so strong and stable. Another reason is that the atoms delocalise electrons, meaning they can move around more freely and this is what makes graphene good in conducting electricity and heat.

Graphene was first isolated from graphite by two researchers Andre Geim and Kostaya Novoselov, in 2004 at the University of Manchester, UK. They discovered it by using sticky tape on a piece of graphite and then repeating the process over and over till they got a single layer of graphene. They also got Nobel Prize in 2010.

Despite having such excellent properties, the use of graphene is still very restricted. We know many ways to use graphene; however, we are not able to develop graphene at a bigger scale while still maintaining its quality. The process used for the mass production of graphene is very complex and expensive. And also, graphene products need to be significantly better than what is already out there. If they are not as good as the material they are trying to replace or if there is little noticeable change, then why even bother to spend so much money on its production. For example, silicone is an excellent material for use in electronics because of its special semiconducting qualities, and many experts haven't identified many drawbacks in using silicone, so if we want to use graphene with the added cost and hassle, it needs to be a real game-changer once the production method has matured enough.



Fortunately, over the years, researchers have identified many methods to produce graphene at a mass scale. One of the most known methods is CVD or Chemical Vapour Deposition, however this method is not much feasible and also releases toxic by-products. Flash graphene is another way of producing graphene, a cheaper, greener, and less power-hungry method than CVD.

While the plentiful supply of this wonder material remains a work of progress, we are now starting to see the release of graphene-based products that can offer significant and tangible benefits over the materials that have already been used. A company called Real Graphene has created graphene-enhanced lithium battery that can cut phone charging time from an hour and half to 20 minutes, lasts 3.5 times longer than conventional batteries, and generates less heat.

In recent years we have seen significant development, but there is still a long way to go until we can recognize and use Graphene to its full potential.



## Electric Vehicles: Downfall and Rising again

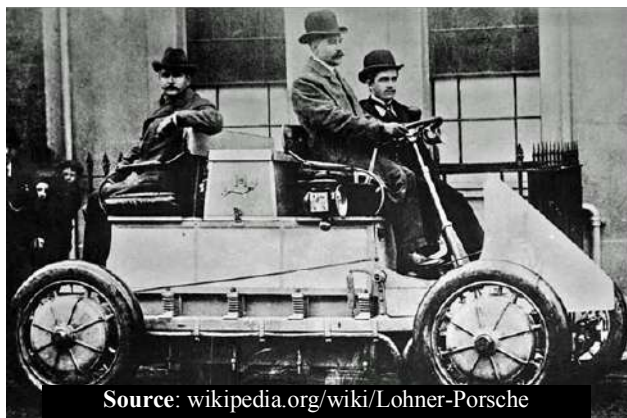
-Jeny Gosai and Nikunj Vagadiya (M.Sc. Chem. Sem. 2)

All of us have been in that phase where we imagine doing great things for the betterment of the society and environment. So it be as a scientist, soldier, public speaker, teacher, etc. Young minds are so full of ideas, yet at the same time, any of them can hardly be implemented. Bound by nature's law, freed by the imaginative world. I want to share one such incident with you. The why's and the ooh's of my mind's questionnaire room.

I always used to wonder why the era of electric vehicles

came to an end in 1930? And why are we trying to build efficient electric vehicles again? In 1910, they were the most promising vehicles, and then all the wheels turned to gasoline-based cars in 1930. What happened between 1910 to 1930? What changed?

Ferdinand Porsche, in 1897, built a wheel-hub motor i.e., electric motor built in a wheel. 1898 first electrical car was built and named Phaeton/ P1 (by Egger-Lohner) (Fig. 1). In 1899 another car was built by Lohner-Porsche named chaise (chair), which consists of two-wheel hub motors (1.8Kw each, 120rpm, 2.5hp), fed by lead-acid battery 0.6kwh (44 cells,80V) it can withstand till 30 miles.



Source: wikipedia.org/wiki/Lohner-Porsche



Fig. 1: Chaise, Lohner-Porsche, 1899, Ref: Khajepour, A., Fallah, M. S., & Goodarzi, A. (2014). *Electric and hybrid vehicles: technologies, modeling and control-a mechatronic approach*. John Wiley & Sons.

In 1900, the first 4 wheel-hub motors drive car was launched by Lohner-Porsche. Later electric vehicles were used for almost all sorts of purposes, so it be trains (Austro-Daimler Landwehr Train or Austro-Hungarian Electrical train), local delivery (Mercedes-Electrique). In the early 20th century, there were almost 30,000 electric cars on US roads and more than 10,000 electric trucks and commercial vehicles. Electric vehicles were the blooming industry at that time.

The very first reason for the fall of electric vehicles was oil and competing technologies maturing. There was crank starting in electric automobiles which was quite hard to operate, but later, due to the invention of electric start by Charles Kettering, gasoline cars were more preferred. The rise of oil production in Texas, Oklahoma, California played a huge role in replacing electric vehicles. As earlier fossil fuels (coal/oil) were burned to rotate generators from which electricity was generated and later stored in batteries. There were renewable energy sources like solar plants and wind electric generation, but they weren't widely spread.







Source: [Trucksplanet.com/models/austro-daimler-a-zug/](https://Trucksplanet.com/models/austro-daimler-a-zug/)



Source: Ask a Hemmings Editor: What was the last vehicle that could be cranked by hand? By Daniel Strohl on Nov 6th, 2020

Later, Henry Ford introduced a gasoline car which was very cheap as compared to the electric one. The gasoline car used to have a cost around 650 USD and the electric car's price was almost 3 times (1750 USD) than that of a gasoline car. The cost of upgrading the battery from lead-acid battery to nickel-iron (by Edison) was nearly 600 USD which made it expensive.

Also, as the focus shifted from in-state business to interstate business, the interstate highways were developed, which made the electric cars hard to use since they can only go up to 30 miles in one charging and it took almost 8 hours to charge again.

That's how from the most promising type of vehicle, it became the almost not producing one.

Now the electric vehicles are rising again as we shift towards cleaner and greener resource of energy. It reduces the carbon emission, but it is also more convenient as now the batteries used are lithium-ion and graphene which charges in 33-50 minutes only and could go on for 500miles. Many companies like Tesla, Nissan, Renaults, Mitsubishi have launched electric cars and are working on making new and better models.

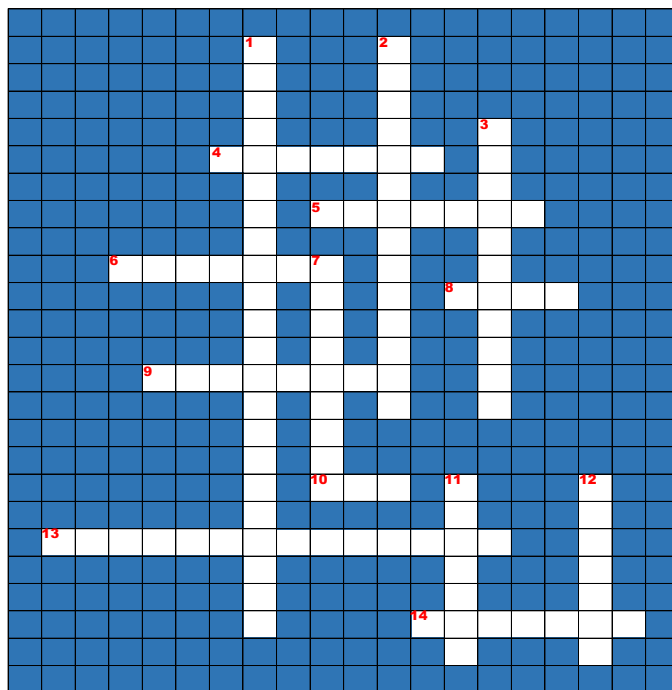


The resources used are also clean as instead of going for conventional methods to produce the electricity, we are taking a turn in the direction of renewable methods like wind and solar. This revolutionary era of electric vehicles is thriving again as it used to in the past. The only difference is that before the technology wasn't so advanced due to which the vehicle lacked in many areas but now the time has changed we are making a lot of difference by using electric vehicles rather than the gasoline-based vehicles.

## CROSSWORD

-Mohil Odedara, M.Sc. Chem. Sem. 2

Down
1. A hydrocarbon with one or more double or triple bond(s) is known as _____.
2. Very large molecules.
3. The shape of $\text{Si}(\text{CH}_3)_4$ is _____.
7. Skincare products are also known as _____.
11. Orange-brown compound (diatomic) that turns colourless when mixed with alkenes.
12. Hydrocarbons having at least one carbon-carbon double bond are known as _____.
Across
4. Alcohol produced by fermentation of sugars.
5. Compounds with the same chemical formula but different structures.
6. A synthetic material which contains polymer as the main ingredient.
8. Bond order of helium molecule is _____.
9. Hydrocarbon with formula $\text{C}_2\text{H}_4$ is called _____.
10. Total number of antibonding electrons in oxygen molecule is _____.
13. The chemical reaction combining monomers to form a polymer.
14. _____ are proteins that act as a biological catalysts.



Find the answers to Crossword on the last page



## CHEMISTRY FACTS

-Aarya Upadhyay (B.Sc. Sem. 4)

*The human body contains enough carbon to provide “lead” (which is really graphite) for 9,000 pencils.*



*The only letter not appearing on the periodic table is J.*



*If you collected an atom of gold for every second after the Big Bang (13.8 billion years!), still you'd only have about 0.13 milligrams of gold.*

*Only a handful of substances are denser as liquids than solids: Water, Silicon, Antimony, Germanium, Gallium, Plutonium, and Bismuth.*

*Carbon is known to have a record of the highest number of allotropic modifications. There are 14 allotropic modifications; among them are coal, diamond, graphite etc.*



*The rarest naturally found element in Earth's crust is Astatine. There is about less than 30g of it.*

*Fool's gold is a name given to the mineral Pyrite. It shows a strong resemblance to gold, but it's just Iron disulfide.*



*Rubber tires are essentially made up of polymers' massive chain link, making it just one, singular molecule.*

*The only metal which is also naturally antibacterial is copper. So, yes, there is some science behind your grandparents storing water copper utensils.*

*Metal makes up the most widespread type of element on the periodic table. Interestingly enough, the only two non-silvery metals are gold and copper.*

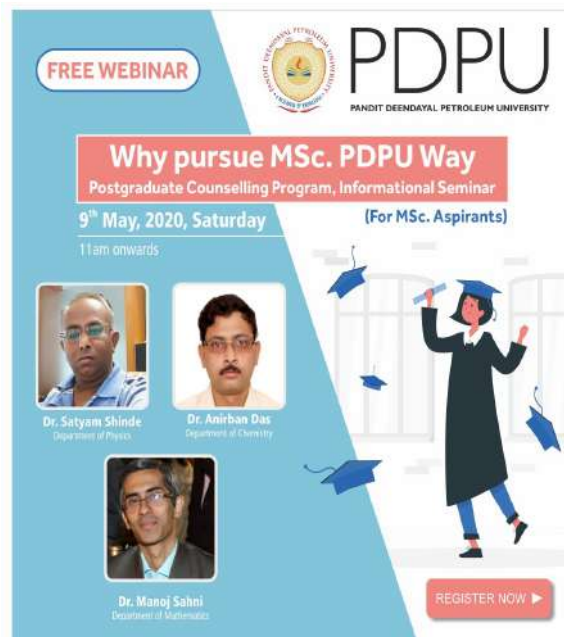
*Marie Curie, the first-ever person and the only woman yet to receive two Nobel Prizes, is also the only person to receive the same for two different sciences, for the discoveries of radioactivity and Polonium, Radium elements.*



# DEPARTMENTAL EVENTS & ACTIVITIES

## Workshops/Webinars Organized

- One day workshop "Publish or Perish: Strategies for Scientific Research Publication" was organized by **Dr. Syed Shahabuddin, Dr. Prakash Chandra, Dr. Rama Gaur, and Dr. Nandini Mukherjee** on February 29, 2020.
- Webinar on "Future of Librarianship: From Do's to Discovery" was organized by **Prof. Rajib Bandyopadhyay** on June 5, 2020.
- Webinar session on "The She of Science World" was organized by **Dr. Rama Gaur, Dr. Nandini Mukherjee, Dr. Megha Balha, & Dr. Anu Manhas** on the occasion of International Women's Day, March 08, 2021.
- Online Interschool Science Quiz on National Science day was organized jointly by **Department of Chemistry, Physics, and Mathematics** on February 28, 2021.





## ONE DAY WORKSHOP PUBLISH OR PERISH: STRATEGIES FOR SCIENTIFIC RESEARCH PUBLICATION








**SPEAKERS**

**Prof. Rajib Bandyopadhyay**  
Professor, HOD  
Department of Science  
School of Technology, PDPU

**Dr. Ramesh K. Guduru**  
Associate Professor  
Department of Mechanical Engineering  
School of Technology, PDPU

**Dr. Kalisadhan Mukherjee**  
Assistant Professor  
Department of Science  
School of Technology, PDPU

**Dr. Syed Shahabuddin**  
Assistant Professor  
Department of Science  
School of Technology, PDPU

**Dr. Prakash Chandra**  
Assistant Professor  
Department of Science  
School of Technology, PDPU

**Highlights**

- Getting started with research articles and proposals
- Research publication ethics and tools
- Modern scientific software in academic writing
- Polishing the article before submission
- Addressing reviewer comments
- Introduction to high impact publications

**Venue: B-Block, GE, B-002 (ITC-1)  
PANDIT DEENDAYAL PETROLEUM UNIVERSITY  
29 February 2020, 9:00 am – 5:00 pm**

**ORGANISED BY: DEPARTMENT OF SCIENCE**



## Organizers



**Dr. Syed Shahabuddin**  
Assistant Professor  
Department of Science  
School of Technology, PDPU



**Dr. Prakash Chandra**  
Assistant Professor  
Department of Science  
School of Technology, PDPU





**Dr. Rama Gaur**  
Assistant Professor  
Rama.Gaur@sot.pdpu.ac.in



**Dr. Nandini Mukherjee**  
Assistant Professor  
Nandini.Mukherjee@sot.pdpu.ac.in



**PDEU**  
PANDIT DEENDAYAL ENERGY UNIVERSITY  
Formerly Pandit Deendayal Petroleum University (PDPU)

## ONLINE INTERSCHOOL SCIENCE QUIZ ON NATIONAL SCIENCE DAY

BY DEPT OF PHYSICS, CHEMISTRY & MATHEMATICS,  
SCHOOL OF TECHNOLOGY


**28<sup>TH</sup> FEBRUARY 2021, SUNDAY**  
(For 11th and 12th, SCIENCE Stream Students only)

**REGISTRATION  
ENDS  
20th February  
2021**

**1st ROUND  
OF QUIZ  
21st February  
2021**

**RESULTS OF  
1st ROUND  
TOP 50  
22nd February  
2021**

**FINAL ROUND  
FOR  
TOP 50  
28th February  
2021**



Registration Link

Participation Certificates  
will be provided

Prize for Top 5 Winners  
(Crossword Vouchers)



**INTERNATIONAL WOMEN'S DAY  
MARCH 08, 2021**

Time: 3:00 PM-5:30 PM

**WEBINAR SESSION ON  
"THE SHE OF SCIENCE WORLD"**

*Conversations with some of the distinguished Women Scientists*



## SPEAKERS









**Dr. Adita Joshi**  
Samariti Foundation,  
New Delhi

**Dr. Mahima Kaushik**  
Delhi University, PDEU, Gandhinagar

**Dr. Poonam Mishra**  
IITRAM, Ahmedabad

**Dr. Kavitha Bharatham**  
TIFR, Mumbai

**Dr. Bhavya Khanna**  
Ministry of Earth Science,  
Govt. of India

**Dr. Mahuya Bandyopadhyay**  
IITRAM, Ahmedabad

**Organising Committee**  
Prof. Sunil Khanna (Patron)  
Prof. Rajib Bandyopadhyay (Head, Dept. of Chemistry)

**Organising Team**  
Dr. Rama Gaur  
Dr. Nandini Mukherjee  
Dr. Anu Manhas  
Dr. Megha Balha

**Organized by**  
Department of Chemistry, School of Technology,  
Pandit Deendayal Energy University, Gandhinagar  
Gujarat-382007

**Under the Aegis of Women Development Cell (WDC, PDEU)**  
[www.pdpu.ac.in](http://www.pdpu.ac.in)

**Title of the Talks:**

- "Juggling between home and office- Mastering professional competency and work-life balance" by Dr. Adita Joshi
- "Women: An Epitome of Strength" by Dr. Mahima Kaushik
- "Present scenario and Future scope for Women in Science and Technology" by Dr. Poonam Mishra
- "Networking and taking credit for your ideas/work: Key factors for women's success in science" by Dr. Kavitha Bharatham
- "Science communication: Opportunities and possibilities for women" by Dr. Bhavya Khanna
- "Women in Science: Women Empowerment" by Dr. Mahuya Bandyopadhyay

**Highlights**

Interactive session with Women Scientists from different fields  
Explore various opportunities available in Science and Non-Science areas  
E-Certificate for the participants  
No Registration Fees  
Open for All

**Link For Registration**  
<https://forms.gle/wcD3x71d833Cf6Sn7>

Scan the QR Code to Register



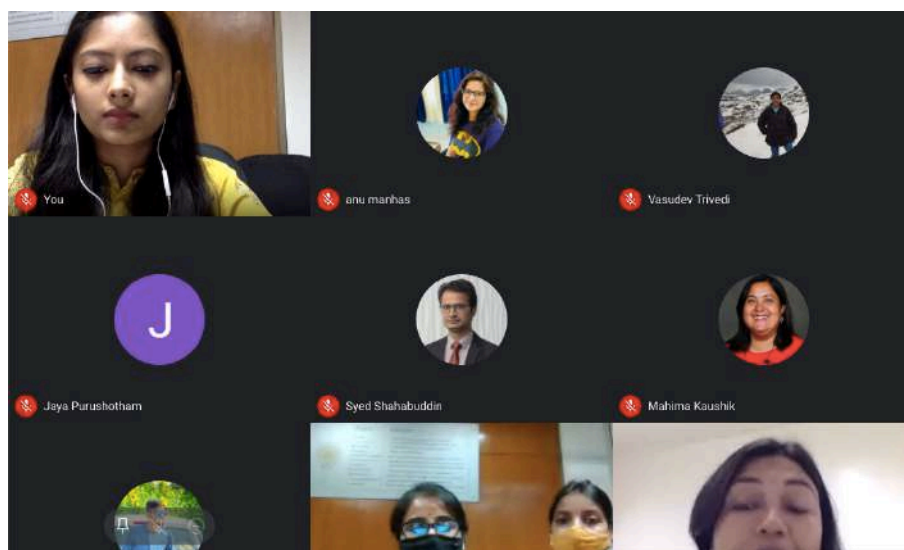




One day workshop "Publish or Perish: Strategies for Scientific Research Publication" on February 29, 2020.



Thesis Defence by Ms. Riddhi Thakkar (Supervisor Prof. Rajib Bandyopadhyay).



Webinar session on "The SHE of Science World" on March 08, 2021.





## INVITED TALKS



Invited talk by **Prof. Parameswar K. Iyer**, Department of Chemistry and Centre for Nanotechnology, IIT Guwahati on “Organic functional nanomaterials: Achieving unique photophysical properties, sensing applications and optoelectronic devices” on March 13, 2020.

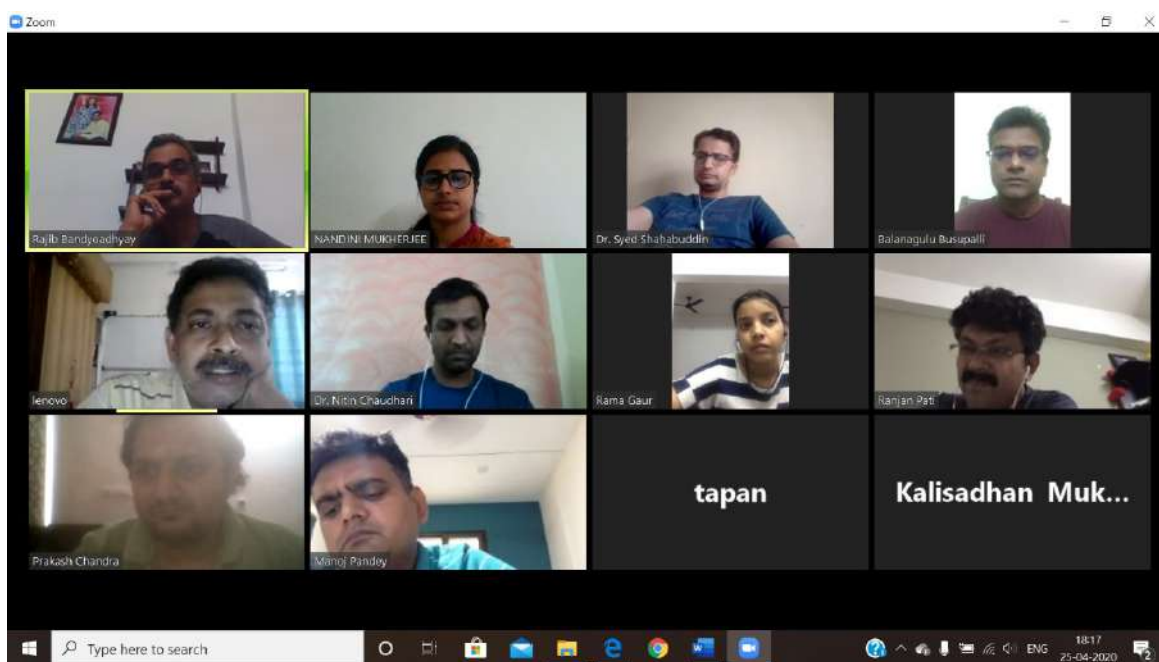


**Dr. Ram Sagar Mishra** of Department of Chemistry, Institute of Science, BHU, after his talk on “Stereoselective Synthesis of Natural Product Inspired New Bioactive Glycohydrids” on January 22, 2020.





Invited talk by **Dr. Ravindra Kumar**, Senior Scientist, CSIR-Central Drug Research Institute (CDRI) Lucknow. 24 January 2020.



Department Meeting during lockdown.







Apollo medical check-up camp on campus post-COVID, faculties coming back to the campus.



Faculty-Student get together on Campus.



## RESEARCH PUBLICATIONS

### Dr. Anirban Das

- B. Mohanty, **A. Das**, R. Mandal, U. Banerji and S. Acharyya (2021) Heavy Metals in Soils and Vegetation from Wastewater Irrigated Croplands Near Ahmedabad, Gujarat: Risk to Human Health, Nature Environment and Pollution Technology, vol. 20, 163-175, <https://doi.org/10.46488/NEPT.2021.v20i01.017>.

### Dr. Anu Manhas

- S. Kediya\*, **A. Manhas\***, M. Y. Lone and P. C. Jha, "A theoretical study describing the sensing mechanism of the novel triarylborane substituted naphthalimide molecule." Journal of Molecular Structure 1228 (2021): 129443, DOI: 10.1016/j.molstruc.2020.129443 (equal contribution).
- **A. Manhas**, S. Kumar and P. C. Jha, Identification of the natural compound inhibitors against Plasmodium falciparum plasmepsin-II via common feature based screening and molecular dynamics simulations, Journal of Biomolecular Structure and Dynamics, (2020), DOI: 10.1080/07391102.2020.1806110.
- J. Soni, N. Sahiba, A. Sethiya, P. Teli, D. K. Agarwal, **A. Manhas**, P. C. Jha, D. K. Joshi & S. Agarwal, "Biscoumarin Derivatives as Potent anti-Microbials: Graphene Oxide Catalyzed Eco-Benign Synthesis, Biological Evaluation and Docking Studies." Polycyclic Aromatic Compounds (2020), DOI: 10.1080/10406638.2020.1852277.

### Dr. Busupalli Balangulu

- **Busupalli**, et al., Solvent-less solid state synthesis of dispersible metal and semiconducting metal sulphide nanocrystals, ACS Sustainable Chemistry & Engineering, 2020, 8, 45, 17000.

### Dr. Kalisadhan Mukherjee

- A. Dey, S. Datta, Sk. A. Moyez, A. Kamila, **K. Mukherjee**, S. Roy, Blending of Dielectric Perovskite with Electron Transport Materials: A Case Study towards Improving Bio-Molecular Devices for Energy Harvest, ECS J. Solid State Sci. Technol. 10 (2021) 013003.
- B.R. Bhagat, V. Jadeja, P. Sharma, K. Joshi, **K. Mukherjee\***, Case study on the use of image analysis for the simple and inexpensive colorimetric detection of Fe (III) in water, Analytical Methods (RSC), 12 (2020) 4509-4516.
- A.K. Kabi, R. Gujjarappa, N. Vodnala, D. Kaldhi, U. Tyagi, **K. Mukherjee**, C.C. Malakar, HFIP-mediated strategy towards  $\beta$ -oxo amides and subsequent Friedel-Craft type cyclization to 2 quinolinones using recyclable catalyst, Tetrahedron Letters, 61 (2020) 152535.
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### Dr. Manoj Pandey

- N. Parikh, M. M. Tavakoli, **M. K. Pandey**, A. Kalam, D. Prochowicz, P. Yadav, Role of spacer cation on the growth and Crystal Orientation of Two-Dimensional Perovskite, Sustainable Energy & Fuels, 2021, 5, 1255-1279.



- T. Chakraborty, Chandra Kanth P., M. U. Trivedi, B. Tripathi, **M. K. Pandey**, Fabrication of janus type bi-layer polymeric membranes for advance water purification, Materials Today; Proceedings, pp. 1, jan 2021.
- Chandra Kanth P., M. U. Trivedi, K. Patel, N. M. Mishra, **M. K. Pandey**, Cucurbituril-Functionalized Nanocomposite as a Promising Industrial Adsorbent for Rapid Cationic Dye Removal, ACS Omega, pp. 3024–3036, jan 2021.
- S. Trivedi, D. Prochowicz, N. Parikh, A. Mahapatra, **M. K. Pandey**, A. Kalam, M. M. Tavakoli, P. Yadav, Recent Progress in Growth of Single-Crystal Perovskites for Photovoltaic Applications, ACS Omega, pp. 1030–1042, Dec 2020.
- A. Mahapatra, N. Parikh, H. Kumari, **M. K. Pandey**, M. Kumar, D. Prochowicz, A. Kalam, M. M. Tavakoli, P. Yadav, Reducing ion migration in methylammonium lead tri-bromide single crystal via lead sulfate passivation, Journal of applied physics, pp. 127, apr 2020.

#### Dr. Nandini Mukherjee

- U. Bhattacharyya, B. K. Verma, R. Saha, **N. Mukherjee**, M. K. Raza, S. Sahoo, P. Kondaiah, A. R. Chakravarty, “Structurally Characterized BODIPY-Appended Oxidovanadium(IV)  $\beta$ -Diketonates for Mitochondria-Targeted Photocytotoxicity”, ACS Omega, 2020, 5, 8, 4282-4292.

#### Dr. Nitin Chaudhuri

- G. M. Tomboc, B. T. Gadisa, M. Jun, **N. K. Chaudhari**, H. Kim and K. Lee, Front Cover Feature- Carbon-transition metal oxide electrodes: Understanding the role of surface engineering for high energy density supercapacitors, Chemistry: An Asian Journal, 2020, 15, 1628-1647.
- D. Prasad, K. N. Patil, **N. K. Chaudhuri**, H. Kim, B. M. Nagaraja and A. H. Jadhav, Paving way for sustainable Earth-abundant metal based catalysts for chemical fixation of CO<sub>2</sub> into epoxides for cyclic carbonate, Catalysis Review, Science and Engineering, 2020, DOI: 10.1080/01614940.2020.1812212.
- N. R. Hemanth, T. Kim, B. Kim, A. H. Jadhav, K. Lee and **N. K. Chaudhuri**, Transition Metal Dichalcogenides-decorated MXenes: Promising 2D Electrodes for Energy Storage and Conversion, Mater. Chem. Front., 2021, DOI: 10.1039/D1QM00035G.

#### Dr. Prakash Chandra

- **P Chandra**, T Ghosh, N Choudhary, A Mohammad, SM Mobin, "Recent advancement in oxidation or acceptorless dehydrogenation of alcohols to valorised products using manganese based catalysts" Coordination Chemistry Reviews (2020) 411, 213241.

#### Prof. Rajib Bandyopadhyay

- D. R. Gandhi, **R. Bandyopadhyay** and S. Parikh, Structural and composition enhancement of Indian Kachchh kaolin clay: characterisation and application as low-cost catalyst, Indian Chemical Engineer, Published online: 12 Oct 2020; DOI: <https://doi.org/10.1080/00194506.2020.1828191>.
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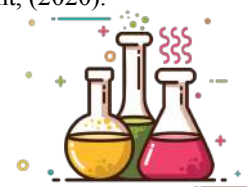
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#### Dr. Rama Gaur

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#### Dr. Syed Shahabuddin

- M.S. Ahmad, N. Abd Rahim, **S. Shahabuddin**, S. Mehmood, A.D. Khan, Effect of WS<sub>2</sub> nano-sheets on the catalytic activity of Polyaniline nano-rods based counter electrode for dye sensitized solar cell, Physica E: Low-dimensional Systems and Nanostructures, (2020) 114466.
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- S.N.A. Shah, **S. Shahabuddin**, M.F.M. Sabri, Evaluation of Thermal Conductivity, Stability and Viscosity of Two Dimensional Hexagonal Boron Nitride Nanofluids, *International Journal of Advanced Science and Technology*, 29 (2020) 304-317.
- S.N.A. Shah, **S. Shahabuddin**, M.F.M. Sabri, M.F.M. Salleh, M.A. Ali, N. Hayat, N.A.C. Sidik, M. Samykano, R. Saidur, Experimental investigation on stability, thermal conductivity and rheological properties of rGO/ethylene glycol based nanofluids, *International Journal of Heat and Mass Transfer*, 150 (2020) 118981.
- S.N.A. Shah, **S. Shahabuddin**, M.F.M. Sabri, M.F.M. Salleh, S.M. Said, K.M. Khedher, Thermal conductivity, rheology and stability analysis of 2D tungsten disulphide-doped polyaniline-based nanofluids: An experimental investigation, *International Journal of Energy Research*, (2020).
- B. Sherino, S.N. Abdul Halim, **S. Shahabuddin**, S. Mohamad, Simultaneous removal of carcinogenic anionic and cationic dyes from environmental water using a new Zn-based metal–organic framework, *Separation Science and Technology*, (2020) 1-14.
- M. Shirani, B. Akbari-Adergani, H.R. Nodeh, **S. Shahabuddin**, Ultrasonication-facilitated synthesis of functionalized graphene oxide for ultrasound-assisted magnetic dispersive solid-phase extraction of amoxicillin, ampicillin, and penicillin G, *Microchimica Acta*, 187 (2020) 1-11.
- A. Sofiah, M. Samykano, **S. Shahabuddin**, K. Kadirgama, A. Pandey, An experimental study on characterization and properties of eco-friendly nanolubricant containing polyaniline (PANI) nanotubes blended in RBD palm olein oil, *Journal of Thermal Analysis and Calorimetry*, (2020) 1-15.
- A. Sofiah, M. Samykano, **S. Shahabuddin**, K. Kadirgama, A. Pandey, A comparative experimental study on the physical behavior of mono and hybrid RBD palm olein based nanofluids using CuO nanoparticles and PANI nanofibers, *International Communications in Heat and Mass Transfer*, (2020) 105006.

#### Dr. Tapan Pal

- D. Majumdar, **T. K. Pal**, D. K. Singh, D. K. Pandey, D. Parai, K. Bankura, D. Mishra, DFT investigations of linear Zn<sup>3+</sup>-type complex with compartmental N/O-donor Schiff base: Synthesis, characterizations, crystal structure, fluorescence and molecular docking. *Journal of Molecular Structure*, 2020, 1209, 127936.
- D. Majumdar Y. Agrawal, R. Thomas, Z. Ullah, M. K. Santra, S. Das, **T. K. Pal**, K. Bankura, D. Mishra, Syntheses, characterizations, crystal structures, DFT/TD-DFT, luminescence behaviors and cytotoxic effect of bicompartamental Zn (II)-dicyanamide Schiff base coordination polymers: An approach to apoptosis, autophagy and necrosis type classical cell death. *Applied Organometallic Chemistry*, 2020, 34, e5269.



- **T. K. Pal**, D. Deb, P. K. Bharadwaj, Metal–organic frameworks for the chemical fixation of CO<sub>2</sub> into cyclic carbonates. *Coordination Chemistry Review*, 2020, 408, 213173.
- P. Shukla, **T. K. Pal**, S. C. Sahoo, M.-H. Du, X.-J. Kong, S. Das, New Family of Heptanuclear Lanthanide {Ln<sub>7</sub>} Clusters: Synthesis, Structure, and Magnetic Studies. *Chemistry Select*, 2021.
- D. Majumdera, S. Dey, A. Kumari, **T. K. Pal**, K. Bankura, D. Mishra, Dicyanamide-intertwined assembly of two new Zn complexes based on N<sub>2</sub>O<sub>4</sub>-type pro-ligand: Synthesis, crystal networks, spectroscopic insights, and selective nitroaromatic turn-off fluorescence sensing. Dicyanamide-intertwined assembly of two new Zn complexes based on N<sub>2</sub>O<sub>4</sub>-type pro-ligand: Synthesis, crystal networks and spectroscopic insights. *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*. 2021, 119612.
- R. Goswami, **T. K. Pal**, S. Neogi, Stimuli-Triggered Fluoro-Switching in Metal-Organic Frameworks: Applications and Outlook. *Dalton Transaction*, 2021.

## BOOK CHAPTERS

**Dr. Prakash Chandra** published a book chapter entitled “Synthesis and Applications of 3d Transition Metal Based Chalcogens Single source precursors” in "Nanomaterials via Single-Source Precursors: Synthesis, Processing and Applications" (2021), Elsevier.

Sukumar Mandal, Sateesh Daguppati, **Rajib Bandyopadhyay** and Asit Kumar Das, Recent Advances in Biomass Gasification: A review, In: *Macromolecular Characterization of Hydrocarbons for Sustainable Future, Applications to Hydrocarbon Value Chain* Ed. Uttam Kumar Bhui, (Springer), (March 2021) p. 239-257; DOI: 10.1007/978-981-33-6133-1; ISBN 978-981-336-133-1

**Dr. Ranjan Pati** published a book chapter entitled “Photoelectrochemical Water Splitting Characteristics of Electrodeposited Cuprous Oxide with Protective Over Layers” (2020), *Advances in Energy Research*, Vol. 1, pp 231-237.

**Dr. Syed Shahabuddin** published the following book chapters:

- **Shahabuddin, S.**, Mazlan, N. A., Baharin, S. N. A., Sambasevam, K. P., & Pandey, A. K. (2021). Intrinsically Conducting Polymer Based Nanocomposite in Photocatalytic Study. In *Advances in Hybrid Conducting Polymer Technology* (pp. 19-51). Springer, Cham.
- **Shahabuddin, S.**, Mazlan, N. A., Baharin, S. N. A., & Sambasevam, K. P. (2021). Introduction to Conducting Polymers. In *Advances in Hybrid Conducting Polymer Technology* (pp. 1-18). Springer, Cham.
- Shah, S. N. A., **Shahabuddin, S.**, & Sabri, M. F. M. (2021). Perspectives of Conducting Polymers Towards Heat Transfer Applications. *Advances in Hybrid Conducting Polymer Technology*, 125-134.

## BOOK

**Dr. Syed Shahabuddin** published the following book with Springer.

- **Shahabuddin, S.**, Pandey, A. K., Khalid, M., & Jagadish, P. *Advances in Hybrid Conducting Polymer Technology*. Springer.



## CONFERENCE PROCEEDINGS

**Prof. Rajib Bandyopadhyay** has published the following conference proceeding:

- Divya Jadav, **Rajib Bandyopadhyay**, Nao Tsunoji, Masahiro Sadakane, Mahuya Bandyopadhyay, Post-synthetic amine functionalized SAPO-5 & SAPO-34 molecular sieves for epoxide ring opening reactions, Materials Today: Proceedings, (2021) <https://doi.org/10.1016/j.matpr.2020.12.986>.

## PATENTS FILED/PUBLISHED/AWARDED

**Dr. Manoj Kumar Pandey's** filed the following patent:

- Chandra Kanth P., Maitrayee Trivedi, **Manoj Kumar Pandey**, "Formulation for synthesis of epoxides from olefins and process thereof". (Patent application number: 201921013586 on 4-04-2019).

**Dr. Ranjan Pati** was granted the following patent:

- Nisarg Shah, **Ranjan K. Pati**, Abhijit Ray and Indrajit Mukhopadhyay, "A Process for Electro deposition of Silicon Nano- Spheres", Indian Patent 332214, Issued on February 17, 2020.

**Dr. Ranjan Pati** published the following patents:

- **Ranjan K. Pati**, Abhijit Ray and Indrajit Mukhopadhyay, "Nanostructured metal oxide particles and process thereof" an Indian Patent Published with an Application No.201921000822A, dated 08/01/2019. Publication Date: 10/07/2020.
- Biren Patel, **Ranjan K. Pati**, Abhijit Ray and Indrajit Mukhopadhyay, "A process of developing thin film Cu<sub>2</sub>SnS<sub>3</sub>", an Indian Patent Published with an Application No.201921000821A, dated 08/01/2019. Publication Date: 10/07/2020.

## EXPERT TALK DELIVERED/ORAL PRESENTATION IN CONFERENCE-WEBINAR-SYMPOSIUM

- **Dr. Busupalli Balangulu** delivered an Invited Lecture on "Metallic and semiconducting nanomaterials for advanced technological applications", at a National Webinar on 'Recent Trends in Materials Chemistry', October 15-17, 2020, RGUKT, Kadapa, Andhra Pradesh.
- **Dr. Busupalli Balangulu** presented a paper on "Self-replication in poly(butadiene) based polymersomes" at 5th 'International Conference on Recent Advances in Materials Chemistry' (ICRAMC-2021, virtual mode), organized by SRMIST, Chennai, February 18-20, 2021.
- **Dr. Kalisadhan Mukherjee** gave an Oral Presentation on "Nano-structured semiconducting metal oxide chemiresistors: Synthesis and study on the kinetics for the interactions with isomeric organic vapors" at the 2nd Indian Materials Conclave and 31st Annual General Meeting of MRSI, held at CSIR-CGCRI, Kolkata, February 11-14, 2020.



- **Dr. Kalisadhan Mukherjee** gave an Oral Presentation on “Nano-structured complex metal oxides: Tailored synthesis and study on their chemiresistive changes due to the interaction with volatile organics” at a National Conference on Recent Advancements in Materials science And Nanotechnology (RAMAN)-2020, Nirma University, Ahmedabad, Gujarat, July 30-August 01, 2020.
- **Dr. Kalisadhan Mukherjee** gave an Invited Lecture on “Getting started with the research articles and scientific proposals” in a One Day Workshop ‘Publish or Perish: Strategies for Scientific Research Publications’ held at Pandit Deendayal Energy University, Gandhinagar on February 29, 2020.
- **Dr. Kalisadhan Mukherjee** acted as a Resource Person for the Fulbright-Nehru Postdoctoral Research Fellowships online mentoring program in the forum of United States India Educational Foundation, New Delhi, April 9, 2020.
- **Dr. Kalisadhan Mukherjee** Chaired a Session in the Session-I-Renewable Energy, 1st National Conference on Innovations in Sustainable Energy and Technology India 2020, (ISET India 2020) Organized by Energy Institute, Bengaluru (Centre of RGIPT, An Institute of National Importance) NMIT Campus, Yelahanka, December 3-4, 2020.
- **Dr. Nandini Mukherjee** delivered an Invited Lecture on “Metal-based Theranostic Agents for Targeted Cancer Therapy” at ‘Nanoscience and Nanotechnology’ Webinar series (Module 2) on January 10, 2021.
- **Dr. Nitin Chaudhari** delivered a Plenary Lecture on "Opportunities and Challenges of Fuel Cell Technology in Aviation" at 2nd National Seminar on Frontiers in Materials and Chemical Sciences” (NSFMC-2020) on September 1, 2020.
- **Dr. Nitin Chaudhari** delivered an Invited Lecture on “Fuel Cell Technology in Unmanned Aerial Vehicles (UAVs)- Challenges and Opportunities” at ‘Nanoscience and Nanotechnology’ Webinar series (Module 2) on January 10, 2021.
- **Prof. Rajib Bandyopadhyay** presented a paper on “Selective Glycerol Dehydration over Hierarchical Microporous Material” at Japan-India YNU Symposium 2020 on ‘Science, Technology and Innovations for SDGs in India and Japan, Green Materials Innovation (GMI) Session’, Yokohama, Japan (held online) December 27-28, 2020.
- **Dr. Ranjan Pati** delivered an Invited Lecture in the international conference entitled “Batteries recycling and recovery in the context of a circular economy: techno-commercial solutions” on 27th May 2020 at Brunel University, London.
- **Dr. Syed Shahabuddin** delivered an Expert Lecture on “Fundamental and Application of Raman Spectroscopy” in UiTM, Malaysia on April 23, 2020.
- **Dr. Syed Shahabuddin** was a Guest Speaker in an online seminar on “Art of Publishing: Publish to Flourish” in UPM, Malaysia on May 5, 2020.
- **Dr. Syed Shahabuddin** gave an Invited Talk for Journal of Academia Editors' Day Workshop on “Polishing your article before publishing” May 19, 2020.





- **Dr. Syed Shahabuddin** delivered an Expert Talk in a One Day Workshop ‘Publish or Perish: Strategies for Scientific Research Publications’ held at Pandit Deendayal Energy University, Gandhinagar on February 29, 2020.
- **Dr. Syed Shahabuddin** gave an Expert Talk in one day seminar on ‘Science: Pathways to Future Technologies’ organized by Pandit Deendayal Energy University, Gandhinagar on June 13, 2020.
- **Dr. Tapan Pal** gave an Invited Talk for Resource Person in Chemistry of International Web Conference - Organized by Don Bosco College and NIT Meghalaya, Assam on July 30, 2020.

## CONSULTANCY

- **Dr. Manoj Pandey** is acting as a Scheduled I Environmental Auditor from Gujarat Pollution Control Board, Gandhinagar.
- **Prof. Rajib Bandyopadhyay** was recognized and renewed as a Scheduled I Environmental Auditor from Gujarat Pollution Control Board, Gandhinagar.

## INDUSTRY/ACADEMIA COLLABORATION

- **Dr. Nitin Chaudhuri** has successfully involved "BNF Technology Inc.", a multinational software company from South Korea for Campus Recruitment, Internship and Collaboration with PDEU.

## PARTICIPATION IN FDP

- **Dr. Nandini Mukherjee** has successfully completed the certified online FDP on "Advanced Materials (Fabrication, Characterization and Applications)" conducted by KIIT, Bhubaneswar, July 20-25, 2020.
- **Dr. Nandini Mukherjee** has successfully completed the certified ATAL FDP on "Life Skills -Emotional Intelligence" organized by St. Martin's Engineering College, Secunderabad, September 21-25, 2020.
- **Dr. Nandini Mukherjee** has successfully completed the certified ATAL FDP on "Nanoparticle based drug delivery system" organized by the Department of Pharmaceutical Sciences & Technology, Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, October 26-30, 2020.
- **Dr. Nandini Mukherjee** attended an online workshop on Research Methodology conducted by Pandit Deendayal Petroleum University, Gandhinagar, May 5-7, 2020.
- **Dr. Nandini Mukherjee** attended a webinar 'Fundamentals of Outcome Based Education' organized by Inpods India, March 28, 2020.
- **Dr. Nitin Chaudhuri** has successfully completed the certified Faculty Development Program (FDP) on “Need for Artificial Intelligence in Energy Storage Systems” organized by Kallam Haranadhareddy Institute of Technology, Dasaripalem, Andhra Pradesh during September 7-11, 2020.



- **Dr. Nitin Chaudhuri** has successfully completed the Faculty Development Program (FDP) on “Startup Support, Innovation Management and Entrepreneurship Development in Educational Institutions” organized by GUSEC, Gujarat University, Ahmedabad, Gujarat during September 14-18, 2020.
- **Dr. Rama Gaur** successfully completed the ‘Effective and Efficient Online Teaching in the age of Corona, A Hands-on workshop’ on 16 May 2020, organized by Teaching Learning Centre (ICT) at IIT Bombay funded by Pandit Madan Mohan Malaviya National Mission on Teachers and Training (PMMMNMNTT), MHRD, Govt. of India.
- **Dr. Rama Gaur** attended online workshop on Research Methodology conducted by Pandit Deendayal Petroleum University, May 5-7, 2020.
- **Dr. Rama Gaur** attended guest lecture by Prof. Yury Gogotsi's Guest Lecture on "MXenes - 2D Carbides and Nitrides of Transition Metals, organized by Team Mettle'21 National Institute of Technology, Tiruchirappalli on January 28, 2021.
- **Dr. Rama Gaur** attended NRCE Faculty Enrichment Webinar: Chemistry on 11th February 2021 National Resource Center for Education, National Institute of Educational Planning and Administration (NIEPA).
- **Dr. Rama Gaur** attended International Webinar "Applications of Mass Spectroscopy and Beyond" going to be held Online by Department of Chemistry, BMS Institute of Technology & Management, Bengaluru, Karnataka, India on 19th September, 2020.
- **Dr. Rama Gaur** attended "The Ashoka Distinguished Policy Speaker Series | Dr. K. VijayRaghavan | The Principal Scientific Adviser, Government of India" on Jul 25, 2020.
- **Dr. Rama Gaur** attended the webinar "Relevance of IEEE Standards in Teaching, Learning and Industry Collaborations" on 04th June, 2020 by IEEE EBSCO India Team.
- **Dr. Rama Gaur** attended Israel National Research Center for Electrochemical Propulsion (INREP) Annual Conference 2020 will be held online on Sept 15-16, 2020 organized by Bar-Ilan Institute of Nanotechnology and Advanced Materials, ISRAEL.
- **Dr. Tapan Pal** attended a Faculty Development Program (FDP) on Assessment and Evaluation in Higher Education A PMMMNMNTT scheme of MHRD Organised by creates IISER Bhopal, July 27-31, 2020.
- **Dr. Tapan Pal** attended an FDP on “Recent advances on Molecular Chemistry and Functional Materials” organized by AICCRS, Amity University, Noida, August 17-21, 2020.

## HONOURS/AWARDS/RECOGNITION

- **Dr. Nitin Chaudhari** became an International Member of Royal Society of Chemistry.
- **Dr. Nitin Chaudhari** became a National Member of Materials Research Society of India.
- **Dr. Prakash Chandra** received Royal Society of Chemistry Membership (MRSC).
- **Prof. Rajib Bandyopadhyay** was nominated by the academic council of Central University of Gujarat, Gandhinagar, as a Member of School Board, School of Applied Material Sciences.



- **Prof. Rajib Bandyopadhyay** was nominated by the honourable VC of M.S. University of Baroda, as one of the external members of the Departmental Research Committee, Chemistry Department.
- **Dr. Syed Shahabuddin** was appointed as International Associate Editor for Journal of Academia, UiTM, Malaysia on March 2020.
- **Dr. Syed Shahabuddin** was appointed as Associate Fellow at Universiti Teknologi Mara(UiTM), Negari Sembilan Campus, Malaysia on December 16, 2020.

## RESEARCH FUNDS SANCTIONED/RECEIVED FROM EXTERNAL AGENCIES

- **Dr. Anirban Das** received 12 Lacs from SERB-DST for project entitled ""Tracking Chromium (VI) migration in groundwater using stable isotopes of Chromium", Sanction order dated 28 August 2020.
- **Dr. Nitin Chaudhari** received DST funded international bilateral research project under Indo-Korea joint Program of Cooperation in Science & Technology (Total fund 1.15 crore).
- **Dr. Rama Gaur** received DST-SERB TARE 2020, "Studies on optical, electrical and microstructural properties of MoS<sub>2</sub>, SnS<sub>2</sub> and MoS<sub>2</sub>-SnS<sub>2</sub> hybrid nanostructured thin films for solar cell applications" (Total fund 15 Lakh).
- **Dr. Ranjan Kumar Pati** received 30 lakhs for the project entitled "Nanostructured Electrolyte Materials for Low Temperature Solid Oxide Fuel Cell (LT-SOFC)" from DST-SERB.

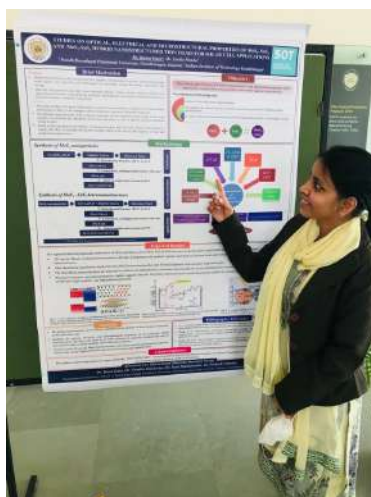
## MoU's SIGNED

### MoU with International Universities:

- With the help of **Dr. Syed Shahabuddin**, MoU signed between PDEU and **UiTM Malaysia**.
- With the help of **Dr. Syed Shahabuddin**, MoU signed between PDEU and **National Defence University of Malaysia UPNM, Malaysia**.



# 1<sup>st</sup> FACULTY RESEARCH REVIEW SYMPOSIUM



**SOT**  
SCHOOL OF TECHNOLOGY

**PDPU**  
PARAGI DEEMED TO BE UNIVERSITY

## 1<sup>ST</sup> FACULTY RESEARCH REVIEW SYMPOSIUM

Showcasing Research Expertise of School of Technology

Organised by : Research & Development Cell, PDPU  
Office of IQAC

Date : 4<sup>th</sup> January, 2021      Time : 10:00am - 2:00pm

Venue : Auditorium Foyer

Best 3 Poster Winners will be Awarded

NOTES : Research poster should be 3 Ft x 4 Ft size, Printing on Matt paper from student book agency in JPEG with minimum 200dpi resolution.





## STUDENTS' CORNER



Rural Internship at Kutch, Gujarat.



## Co-Curricular & Extra-curricular Activities

### Industrial visit/Tech-fest/Educational trips



Student visit to Udaipur Solar Observatory, PRL.



TECH FEST 2020







**Event:** TechFest 2020, technical festival held at IIT Bombay, organized by IIT-Bombay (3rd Jan 2020- 5th Jan 2020).

**Model details:** Hybrid coagulation-photocatalytic system for treatment of textile effluent.

**Group:** WICTRE (Water Innovation Centre: Technology, Research & Education); collaborative efforts of IIT Bombay, NCL Pune, PDPU- Gandhinagar, Gujarat, IIT- Hyderabad under the umbrella of a research and innovation centre at IIT Bombay.

**Student Presenters:** Triparna Chakraborty, Maitrayee Trivedi, Chandrakanth P.

**Faculty members:** Dr. Manoj Pandey, Dr. Brijesh Tripathi.



B.Sc. students for attending 7<sup>th</sup> International Exhibition & Seminar on Laboratory, Scientific, Analytical, Diagnostics Instruments Chemicals and Consumables going to be held at Gujarat University Convention & Exhibition Centre, Ahmedabad, Gujarat on November 7, 2019.





Group Photo of Ph.D. Students, Department of Chemistry.



Results	
Listening	7.5
Reading	7.0
Writing	6.5
Speaking	7.5
<b>Overall</b>	<b>7.0</b>

Vrajrajsinh Jadeja got admission in Georgian College Canada and scored 7 in IELTS.



Abhishek Bhalodiya & Bhargav Nandasana, Research Paper Presentation.



Mr. Mohil Odedara, M.Sc. student, participated in webinar of 2<sup>nd</sup> Module of Webinar Series on Nanoscience and Nanotechnology and also attended 5<sup>th</sup> International Geothermal Conference: Geothermal as a Green Energy.







Bhooma Bhagat, volunteered for a food packets distribution to needy in the COVID-19 pandemic lockdown. The needy were provided with monthly groceries.

## STUDENTS' ACHIEVEMENTS

1. Nishtha Patel from B.Sc. Sem. 6 secured ORSP project grant.
2. Nishi Parikh, a Ph.D. scholar, working with Dr. Manoj Pandey, cleared GATE 2020.
3. Nishi Parikh (Ph.D. scholar) got Best Poster Award at 3rd Generation PV in the Developing World Conference organized by Newcastle University, UK.
4. Mr. Vrajrajsinh Jadeja, B.Sc. final year student (1st Batch from PDEU), has published his 1st peer reviewed journal article in International Journal Analytical Methods, Royal Society of Chemistry.
5. Ph.D student Ms. Bhooma Bhagat has been selected for the SHODH Scheme, Govt. of Gujarat. She will receive a research fellowship of Rs. 15000 pm for 2 years.
6. Ph.D student Ms. Bhooma Bhagat has won best paper award in Digital International Conference 2020 on Role of Innovation, Entrepreneurship and Management for Sustainable Development organized by OP Jindal University, held on September 26-27, 2020.
7. Ms. Mauli Mehta, B.Sc. final year student (1st Batch from PDEU), secured the seat for Master's degree program at USA and Canada.



## UPCOMING EVENTS

International Symposium on Materials of the Millennium: Emerging Trends and Future Prospects (MMETFP-2021) Nov 2021, Organized jointly by Department of Chemistry and Physics.

[illegible]

### Answers to Crossword:

**DOWN:** 1. Unsaturated Hydrocarbon, 2. Macromolecules, 3. Tetrahedral, 7. Cosmetics, 11. Bromine, 12. Alkenes

**ACROSS:** 4. Ethanol, 5. Isomers, 6. Plastic, 8. Zero, 9. Ethylene, 10. Six, 13. Polymerization, 14. Enzymes



## Behind the Scenes...





UGC RECOGNIZED

# PDEU

PANDIT  
DEENDAYAL  
ENERGY  
UNIVERSITY

Formerly Pandit Deendayal Petroleum University (PDPU)

Next Issue in June...