



RADIANCE

DEPARTMENT OF CHEMISTRY

HIGHLIGHTS 2015-2016

EVENTS

FRESHERS WEEK
• TREASURE HUNT

CUL WEEK
• SCAVENGER HUNT

CUL-AH
• CHRONICLES OF
CHEMISTRY

• A talk on
*'Industry-
Academia
Interface'*
during which the
students who
completed their
internships were
awarded their
certificates.

• The CATALYST
programme by
General Electronic

AWARD TO THE DEPARTMENT OF CHEMISTRY



The department of chemistry, Mount Carmel College was honoured with a special award for having conducted the lead certification course for the past four years. The award was given by the Indian Society for Lead Awareness and research (InSLAR) and the Indian Institute of Medical Science (IIMS), Jodhpur, in collaboration with the World Health Organisation. The award was presented by Mr. Venkatesh Thuppil, Director of National Referral Center for lead poisoning in India.

'Brainstorming' at GE

A three day workshop was organised by the GE healthcare in collaboration with the Department of Chemistry, Mount Carmel College, called The 'CATALYST' programme at John.F.Welch Technology Center(JFWTC) from 7th - 9th January 2016. Ten students from our college had the privilege of participating in the workshop.

We were addressed by Senior Scientists and Product Managers on topics like Gene Modulation and Gene Editing, SPR and Chromatographic techniques. The team of GE also gave us an insight to the BIACORE™ and AKTA™ Technologies for isolation and purification of proteins.

We were exposed to different corporate aspects like business, economy, profit-loss, inventions-discoveries, patenting etc. and the challenges surrounding it which didn't fail to surprise us. They helped us in Resume Building and also gave us the recruiter's point of view to it.

Then we presented our solutions for problem solving questions to the GE team. The presentation became even more challenging and exciting as Mr.Lalit Kishore,GM, GE healthcare also joined the panel to encourage, appreciate and guide us.

In those three days we experienced a corporate environment, the role we have to play as an employee, the challenges involved and yes, to find different ways to solve it. The best part of the workshop was that every session was interactive and the presenters made every topic so interesting that we as students did not feel out of place. And thus they made sure that the most productive results were delivered. The whole team of GE was extremely encouraging and motivated us to push our boundaries to explore the impossible and make it possible.

I would like to thank GE and the Department of Chemistry, Mount Carmel College for organising such a brilliant workshop.

Reshma III BtCB

Internship at Ce-Chem Pharmaceuticals

A four day workshop was organized by Ce-Chem Pharmaceuticals which is situated in Peenya in collaboration with the Department of Chemistry, Mount Carmel College. Students had hands on exposure with the experiments and the instrumentation of the laboratory. Never before experience at the industrial level. Friendly and approachable staff members helped the students to understand things better. I would like to thank Ce-Chem and the Department of Chemistry, Mount Carmel College for giving us such a great opportunity and exposure to the industrial world.

Durga shree III PCM

Scientists create renewable fossil fuel alternative

Researchers have engineered the harmless gut bacteria *E. coli* (*Escherichia coli*) to generate renewable propane. The development is a step towards commercial production of a source of fuel that could, one day provide an alternative to fossil fuels.

Propane is an appealing source of cleaner fuel because it has an existing global market. In its current form it makes up the bulk of LPG (liquid petroleum gas), which is used in many applications, from central heating to camping stoves and conventional motor vehicles. Propane is already produced as a by-product during natural gas processing and petroleum refining but petrol and natural gas are non-renewable resources.

A team of scientists from Imperial College London and the University of Turku in Finland used *Escherichia coli* to interrupt the biological process that turns fatty acids into cell membranes. By stopping this process at an early stage they could remove butyric acid, a nasty smelling compound that is an essential precursor for propane production. To interrupt the process, the researchers discovered a new variant of an enzyme called thioesterase which specifically targets fatty acids and releases them from the natural process. They then used a second bacterial enzyme called CAR to convert butyric acid into butyraldehyde. Finally they added a recently discovered enzyme called aldehyde-deformylating oxygenase (ADO), which is known to naturally create hydrocarbons in order to form propane. By stimulating ADO with electrons they were able to substantially enhance the catalytic capability of the enzyme and ultimately produce propane.

The scientists chose to target propane because it can easily escape the cell as a gas yet requires little energy to transform from its natural gaseous state into a liquid that is easy to transport, store and use. Their ultimate goal is to insert this engineered system into photosynthetic bacteria, so as to one day directly convert solar energy into chemical fuel.

Although small amounts of the fuel have been produced so far, the fuel produced is ready to be used in an engine straight away. This opens up possibilities for future sustainable production of renewable fuels that at first could complement and thereafter replace fossil fuels like diesel, petrol, natural gas and jet fuel.

The results of the study are published in the journal *Nature Communications*.

Aishwarya Rajeev III CZM

What causes bruises to turn a greenish yellow color over time?

Biliverdin; An injury to the capillaries injure red blood cells, which turns your skin violet.

The first product is biliverdin, which is green in color, followed by bilirudin, which is yellow in color.

Novel drug for cancer

Triazole, a new small molecule synthesised by scientists at Hyderabad based Indian Institute of Chemical Technology has shown to effectively control growth of cancerous cells by preventing the mis-expression of a specific micro RNA (they are non coding RNA involved in gene regulation and many developmental processes) involved in tumor formation.

It was found that uncontrolled cell growth was drastically reduced when the molecule was inserted into cancerous cell lines. The molecule also acted as HDAC protein inhibition human tumor cells and *Drosophila* larvae during in vivo experiments. HDAC inhibitors are known to promote apoptosis.

Interestingly, it was also found that the novel molecule specifically acted as a negative regulator for bantam miRNA. The mis-expression of bantam miRNA is responsible for diseases of cell proliferation that inhibit apoptosis.

With the in vivo studies conducted using *Drosophila* model (the nature of apoptosis is similar to humans), the researchers now propose to carry out experiments in rat models and eventually conduct clinical studies.

T.Sharanya Nair III CZM



Special points of interest:

Propane an amazing alternative for fossil fuel



Special points of interest:

Triazole to the rescue

Discovery of new elements in periodic table

Elements 113, 115, 117 and 118 have formally been recognized by the International Union of Pure and Applied Chemistry (IUPAC). The organization's announcement means the seventh row of the periodic table is finally complete.

All four elements are not found in nature, and were synthetically created in laboratories. Until now, these elements had temporary names and symbols on the periodic table as their existence was hard to prove. Since they decay extremely quickly, scientists found it difficult to reproduce them more than once. To search element 113 they bombarded a thin layer of bismuth with zinc ions travelling at about 10% the speed of light, by this they would theoretically fuse and would find element 113. Element 113 – currently known by its placeholder name ununtrium – is the first to be discovered in East Asia. It was created by Kosuke Morita's group at the RIKEN Nishina Center for Accelerator-based Science in Japan, by firing a beam of zinc-70 at a target made of bismuth-209. Elements 115 (ununpentium), 117 (ununseptium) and 118 (ununoctium) were discovered by groups collaborating across three institutions – Lawrence Livermore National Laboratory in the US, the Joint Institute for Nuclear Research in Russia and Oak Ridge National Laboratory in the US.

Hitali N T I BTCZ

I too had a Chem Story

"When I met him, there definitely was some chemistry".

I feel bad for chemistry. Imagine if we manage to personify it, then Chemistry would forever be the wingman who got friend zoned. My case would chiefly rest on the prospects as to why Chemistry would be the perfect partner with a few profanities hurled occasionally when his ridiculous close relationship with the Bunsen Burner inflamed the jealousy within me.

We were in grade fifth, and there he was. The tenth chapter and it was love at first sight. He was more fun in the beginning. What with me knowing about his elements and compounds, his significance in daily life etc and the more I learnt about his bondings, my bond strength with him increased immensely. Our school puppy love was a sweet experience. In lab, he gifted me with pretty colours of copper precipitates and sometimes teased me with the rotten egg smell of Hydrogen Sulphide.

But as time went on, like all relationships, our intramolecular attractions grew weaker because of extraneous forces or internal disturbances when exposed to variations of our constants. We were in college now. The funny, cute teases were not so adorable anymore. Through all instances like, the yellow icky stings of the concentrated acids and the not so permanent pale pink of potassium permanganate ostensibly claiming to be a self indicator, I was blamed. But, I still stuck through. I still chose him to play a *Major* part in my life.

Now, every relationship undergoes a test from the Divine. Ours did too. I learnt that Chemistry was much more than what I had anticipated. I began to see this other side of him. And thus I spent many hours in determining his viscosity, temperatures and weights with a wary smile as the surface tensions grew. At one point, we almost broke up. How could I not? I had other subjects in my life that needed attention and in this dilemma of finding balance, Chemistry, though not sidelined, was slightly shadowed with lack of the same rigorous passion that once existed back when we met back in fifth grade.

But true love withstands the test of time, second test after divinity, first, if you're an atheist. And as graduation neared, questions of the unforeseen arose and as future plans were in a disgruntled mess, Chemistry emerged strong. It was that simple. He still inspired me. He still left me intrigued and he still was where I derived my passions from. We will go a long way. Maybe one day he'll get down on his knee and give me a diamond doctorate. Maybe one day, I will walk down the aisle and I will share his name with a Nobel trophy. Maybe one day, we might even make a pretty coloured, sweet smelling compound of our own. Maybe one day, when I'm sixty and still toiling in the lab, late at night, he'll walk in looking young as ever, encircle me within his arms and whisper,

"After all this time?"

"Always".

Deeksha M Rao III CZM



Special points
of interest:

"seventh
row of the
periodic
table is
finally
complete."



Special points
of interest:

"But true
love
withstands
the test of
time"

The Yin-Yang of chemotherapy

Disclaimer: This piece of writing will end with a question that the readers should answer. There is no need to panic. The writer will include all necessary information needed to make the readers competent enough. It is time to fire up those neurones!

Billions of dollars and resources have been put into cancer research. Although I do not see a cure for the disease any time soon there is, however, an alternative chemotherapy that can add buy time for the patient. Let us skip the great importance that this research has and how it monopolises NIH funding and dive into the chemotherapy. How does it work?

Cancer cells are no foreigners to our body. They are what we could call the traitors of the body. In fact they are normal cells who suddenly go rogue and influence the other cells to join them. If we start with a basic knowledge of cancer cells dividing faster than other cells it would be correct to derive that nucleotide synthesis is also faster in these cells. The substrate for nucleotide synthesis is dihydrofolate. In chemotherapy we make use of methotrexate. It is a competitive inhibitor of dihydrofolate. A competitive inhibitor is a molecule that replaces another in a reaction but does not give the desired end product due to the obvious chemical differences.

For a short period of time the cells are exposed to methotrexate. Since the time duration is kept short, only the cells that divide rapidly are affected and die due to lack of dihydrofolate. The cells are then flooded with the normal substrate to save the non-cancerous cells. That is the yang of chemotherapy. The yin is the loss of hair and digestive problems such as constipation and mouth sores. Based on the information provided, why do you think that happens?

Netra Kadambi III CBM

DID YOU KNOW?

One bucket of water contains more atoms than there are bucketfuls of water in the Atlantic Ocean.

Recycling Light

We all have heard about trash recycling but has anyone ever heard about light recycling?!

According to a study published in Nature Nanotechnology, a team of MIT researchers describes another way to recycle light emitted at infrared wavelengths which usually is wasted while optimizing the emission of useful visible wavelengths. While as a proof of the concept, the research group built a more energy efficient incandescent light bulb, the same approach can also be used to improve the performance of other hot thermal emitters, including thermo photovoltaic devices.

"A light bulb filament at high temperatures can reach upto 3000K such which can deteriorate nanostructures and it is impossible to alter the emission spectrum by having a nanostructure directly on the hot surface of the emitter" says ilic, the lead author of the study. The team solved the problem by surrounding the hot object with special nanophotonic structures that spectrally filter the emitted light, meaning that they let the light reflect or pass through based on its color (i.e. its wavelength). Because the filters are not in direct physical contact with the emitter, temperatures can be very high. To showcase this idea, the team picked one of the highest temperature thermal emitters available -- an incandescent light bulb. They designed nano filters to recycle the infrared light, while allowing the visible light to go through. Here the challenge was to extend the desired optical properties across all directions.

In the new-concept light bulb prototype built by the authors, the efficiency approaches some fluorescent and LED bulbs. Some practical questions need to be addressed before this technology can be widely adopted. The last point captures the main motivation behind the work. "Light radiated from a hot object can be quite useful, whether that object is an incandescent filament or the Sun," says a co scientist at MIT. At its core, this work is about recycling thermal light for a specific application.

Hamitha Banu III CZM

Special points of interest:

"Cancer cells are no foreigners to our body."

Special points of interest::

"Light radiated from a hot object can be quite useful, whether that object is an incandescent filament or the Sun."



• **What, in your opinion, is an ideal education system?**

We have seen the drastic change from annual system to semester system. In the semester system we give more importance to co-curricular activities while in annual we enjoyed teaching because of the ample time available for students to prepare. Therefore ideally, I would prefer annual system with lots of co-curricular activities. In my opinion, that balance is missing in this system.

• **What do you look forward to as a teacher?**

This profession is very fulfilling especially when former students come back recall and appreciate the time they enjoyed in your class. When they were with us, they would not have understandably shown their appreciation so it is very exciting when they come up to you and say how they still refer to your notes and how something small you said changed them. My family members are jealous of me (laughs). They are well known in their respective fields but when it comes to popularity, I believe I have the upper hand.

• **What made you choose Chemistry?**

To be honest, I was not sure of what to do in college. I loved Physics to start with but I always scored more in Chemistry. Nevertheless I loved all my three subjects. In fact, for my M.Sc. I applied for all the three subjects. It so happened that the Chemistry results came first probably because we are fast (laughs) so I joined. To start with I was not passionate about the subject but over the time I have grown to love it.

Given a chance, would you choose Physics now?

I do not think so. I would still pick up a book and read concepts in Physics. However I would not keenly pursue teaching or research work in it.

• **Could you share with us the single moment in your career that defined you?**

I cannot answer that question because there was never a single life changing moment. I have always quickly adapted to changing situations. However I realized I am not keen on managing crisis. I get worked up in a crisis. Nevertheless I have never regretted about anything over the years.

• **Last remarks before retirement?**

My countdown has already started. I was wondering whether I will miss Chemistry, the college or my students. I realized I will miss my students the most. Over a period of time you get attached to the students because you spend more time with them. Without realizing we get up every day in the morning, come to college and teach. Soon it becomes a habit we associate ourselves with so deeply. It would be hard to get rid of. After this I want to explore other hobbies. I love singing and dancing of all forms so I would use the time to go to all the shows I have not been able to because of the lack of time. I look forward to travelling. I have been all over India but even if you tell me to go to Nandi Hills I would be ready for it!



• **What, in your opinion, is the ideal education system?**

My personal view is that whatever is available in Google should not be taught. Teaching should not merely encompass giving away facts. Instead it should be about making you feel curious about the subject so that you leave the class wanting to know more. What is ESR? You can read about it but if I can make you curious about it and make you think, I have done my job. Unfortunately, in my opinion, the education is not catering to it at all. What is the point of coming to college? Whatever we learn here we can also learn at home. You need to familiarize with the notion that you might not always be right. You need to listen and incorporate other views.

You should agree to disagree.

• **Where is your passion for Chemistry rooted?**

My passion lies in teaching. If not Chemistry maybe I would have taught Economics. Logical and analytical thinking is very necessary in Chemistry, like in Economics, Chemistry became the choice for which my way of thinking synchronised so that is the reason I was inclined towards Chemistry.

• **Over the years how have you adapted to changes in teaching methods?**

I joined Mount Carmel in 1982. At that time we had a piece of chalk, a blackboard and teaching mainly centred around giving the students information. Currently we have a lot of facilities. We have the Internet and LCD screens now. When I was in second year BSc. there was only one computer in South India. Now we can teach with PowerPoint presentations. Earlier students viewed us as the primary source of knowledge. Now the approach is different. To keep the class interested is more challenging now because the students can acquire whatever I teach elsewhere.

• **What do you think a teacher should do to instil values academically and to engage the classroom, because as you said, everything now is available at the click of a button?**

Teachers should not be rigid. We should be open to the idea that students may know more than us about a particular topic so we have to give more opportunities for the students to explore the subject. There is a difference between "I have to teach the periodic table" and "the student might come up with a better explanation for the concept". You have to help the students love the subject. Even though the student takes up another subject later on they should be able to apply whatever they had learnt earlier. It would be ideal if the teachers could be a role model for the students and create an impact in their lives. I think that is the essence of "the teacher".

• **Any last remarks before retirement?**

For me anything should start with Chemistry. If you have studied ESR, remember this.

Enjoy what you do, Strive to do it better and have no Regrets later.

Internship At LGC Promochem

It was in May, 2015 that six students(Ankita Amar, Supritha Iyengar, Nandini Reddy, Netra Kadambi, Deeksha M Rao and Manasa Shastry) were chosen by the Chemistry department to intern at LGC Promochem, a world-renowned manufacturer and distributor of reference materials and proficiency testing schemes.

At this internship, we saw all the chemistry that we had learnt from textbooks, come to life! Under the able guidance of our mentor scientists and the expert counsel of Dr. Malladi, Chief Scientific Officer and Dr. Shaktivel, Group Leader, we participated actively in the Research and Development department. We were lectured by the scientists on various synthetic and analytical techniques used in pharmaceutical chemistry. Later, we were given the opportunity to design and perform the synthesis of various drugs like aspirin, paracetamol, etc. The analysis of the purity of these samples was also taught to us, by which we were exposed to new and complex analytical techniques like GCMS, HPLC along with simple methods like paper chromatography.

At the end of two months of internship, we began to look at the subject of Chemistry from a new, refreshed perspective. We were given a wonderful glimpse into the world of research.

We are grateful to Mr. BRS Rao, the Managing Director of LGC Promochem India for granting us an experience of a lifetime. Also, we thank the scientists for coaching us patiently. Lastly, we are truly thankful to the Department of Chemistry for giving us a great foundation in the subject as well as letting us explore its applicability.

Manasa R Shastry III PCM

DID YOU KNOW?

The human body contains enough carbon to provide graphite for 9000 pencils!



EDITORIAL TEAM



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