INDIAN INSTITUTE OF TECHNOLOGY PATNA

THC TRIBUNE

(A MAGAZINE FOR CHEMISTRY COMMUNITY)

ON BEHALF OF THRESHOLD CLUB

DIVYANSHU KHANDELWAL

CONTENTS

ALL AROUND THE WORLD

RECENT WORKS BY SCIENTISTS!!

How the darkness and the cold killed the dinosaurs?

Sixty six million years ago, the sudden extinction of the dinosaurs started the ascent of the mammals, ultimately resulting in humankind's reign on Earth. Climate scientists now reconstructed how tiny droplets of sulfuric acid formed high up in the air after the well-known impact of a large asteroid and blocking the sunlight for several years, had a profound influence on life on Earth. Plants died, and death spread through the food web. Previous theories focused on the shorter-lived dust ejected by the impact. The new computer simulations show that the droplets resulted in long-lasting cooling, a likely contributor to the death of land-living dinosaurs. An additional kill mechanism might have been a vigorous mixing of the oceans, caused by the surface cooling, severely disturbing marine ecosystems.

Link: https://www.sciencedaily.com/releases/2017/01/170113133043.htm

Improving longevity of functionally integrated stem cells in regenerative vision therapy

One of the challenges in developing stem cell therapies is ensuring that transplanted cells can survive long enough to work. Researchers report one of the first demonstrations of long-term vision restoration in blind mice by transplanting photoreceptors derived from human stem cells and blocking the immune response that causes transplanted cells to be rejected. The findings support a path to improving clinical applications in restoring human vision lost to degenerative eye diseases.

Link: https://www.sciencedaily.com/releases/2017/01/170112141243.htm

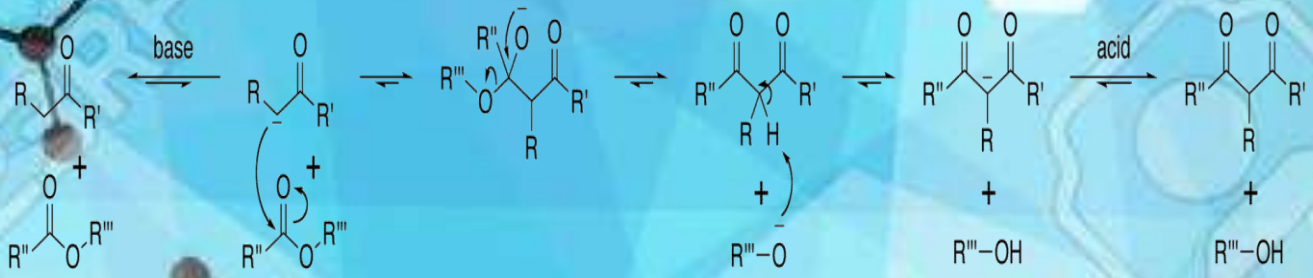
Learning zone

REACTION YOU MUST KNOW

CLAISEN CONDENSATION

The **Claisen condensation** is a carbon–carbon bond forming reaction that occurs between two esters or one ester and another carbonyl compound in the presence of a strong base, resulting in a β-keto ester or a β-diketone.It is named after Rainer Ludwig Claisen, who first published his work on the reaction in 1887.

Mechanism



In the first step of the mechanism, an α-proton is removed by a strong base, resulting in the formation of an enolate anion, which is made relatively stable by the delocalization of electrons. Next, the carbonyl carbon of the (other) ester is nucleophilically attacked by the enolate anion. The alkoxy group is then eliminated (resulting in (re)generation of the alkoxide), and the alkoxide removes the newly formed doubly α-proton to form a new, highly resonance-stabilized enolate anion. Aqueous acid (e.g. sulfuric acid or phosphoric acid) is added in the final step to neutralize the enolate and any base still present. The newly formed β-keto ester or β-diketone is then isolated. Note that the reaction requires a stoichiometric amount of base as the removal of the doubly α-proton thermodynamically drives the otherwise endergonic reaction. That is, Claisen condensation does not work with substrates having only one α-hydrogen because of the driving force effect of deprotonation of the β-keto ester in the last step.

INFORMATION ZONE

GAS AUTHORITY OF INDIA LIMITED (GAIL)

Gas Authority of India Limited (GAIL) is the largest state-owned natural gas processing and distribution company in India. It is headquartered in New Delhi. It has the following business segments: natural gas, liquid hydrocarbon, liquefied petroleum gas transmission, petrochemical, city gas distribution, exploration and production, GAILTEL and electricity generation. GAIL was conferred with the Maharatna status on 1 Feb 2013, by the Government of India. Only six other Public Sector Enterprises (PSEs) enjoy this coveted status amongst all central CPSEs. GAIL was listed in the 131st position among India's most trusted brands according to the Brand Trust Report 2014, a study conducted by the Trust Research Advisory.

GAIL (India) Limited, a Maharatna PSU is looking for committed, vibrant and passionate young **Graduate Engineers** desirous of joining GAIL as **Executive Trainee (ET)**. GAIL will be utilizing Graduate Aptitude Test in Engineering-2017 score (**GATE-2017-Score**) for recruitment of Executive Trainees in the above disciplines during the year 2017.

GAIL Recruitment through GATE 2017- About the Company

Position

Executive Trainee (ET)

GAIL Recruitment through GATE 2017- Eligible Disciplines

Chemical, Mechanical , Electrical, Civil and Instrumentation.

GAIL Recruitment through GATE 2017- Educational Qualification

POST /DISCIPLINE	MINIMUM ESSENTIAL QUALIFICATIONS REQUIRED
Executive Trainee (Chemical)	Bachelor Degree in Engineering in Chemical/ Petrochemical/ Chemical Technology/ Petrochemical Technology with minimum 65 % Marks
Executive Trainee (Mechanical)	Bachelor Degree in Engineering in Mechanical/ Production/ Production & Industrial/ Manufacturing/ Mechanical & Automobile with minimum 65 % Marks.
Executive Trainee (Electrical)	Bachelor Degree in Engineering in Electrical/ Electrical & Electronics with minimum 65 % Marks.
Executive Trainee (Civil	Bachelor Degree in Engineering in Civil with minimum 65 % Marks.

Selection Process

Based on the **GATE-2017 score** and requirement, candidates will be short-listed for **Group Discussion and/ or Personal Interview** for the position of Executive Trainee in the above disciplines

Willing candidates should appear in any of the following examination papers in **GATE 2017**

Chemical Engineering
Mechanical Engineering
Electrical Engineering
Instrumentation Engineering
Civil Engineering
Computer Science and Information Technology Engineering

Important Dates

GAIL Online application begins: **10th January 2017 (1100 hrs)**
GAIL Online application ends: **17th February 2017(1800 hrs)**

GAIL (India) Limited (A Govt. of India Undertaking)
GAIL Bhawan, 16, Bhikaiji Cama Place, New Delhi-110066; Phone No.: 011-26172580, Email career@gail.co.in, Website **www.gailonline.com**

FUN ZONE

CHEMISTRY WORDSEARCH

CHEMICAL ELEMENTS WORD SEARCH PUZZLE

Z	H	P	V	B	M	E	R	C	U	R	Y	X	G	A	D	A
L	M	L	L	C	D	N	O	L	R	R	N	P	D	W	Q	T
J	W	A	P	H	C	U	I	W	C	O	A	B	U	H	G	A
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S	M	D	Y	D	A	G	T	I	O	E	D	J	B	C	H	N
G	A	N	P	R	U	W	N	U	T	N	N	K	B	Z	M	T
M	U	E	T	A	A	R	S	E	N	I	C	Z	Z	O	R	I
Q	B	R	O	M	I	N	E	H	S	G	O	I	Y	S	K	M
E	L	C	N	L	W	F	P	C	W	I	S	D	T	Q	B	O
P	O	T	A	S	S	I	U	M	N	A	U	T	I	R	K	N
C	O	B	A	L	T	I	T	A	N	I	U	M	E	N	R	Y
N	C	A	L	C	I	U	M	A	H	N	Q	J	I	N	E	F

ANTIMONY	CARBON	KRYPTON	PLATINUM
ARSENIC	COBALT	MAGNESIUM	POTASSIUM
BISMUTH	COPPER	MERCURY	TITANIUM
BROMINE	HYDROGEN	NITROGEN	TUNGSTEN
CALCIUM	IODINE	OXYGEN	URANIUM

www.WordSearchAddict.com

NOTE: Words can be from upward to downward(vice-versa), left to right(vice-versa) and diagonally.

EXPLORE ZONE

MEDICINAL CHEMISTRY

Medicinal chemistry and pharmaceutical chemistry are disciplines at the intersection of chemistry, especially synthetic organic chemistry, and pharmacology and various other biological specialties, where they are involved with design, chemical synthesis and development for market of pharmaceutical agents, or bio-active molecules (drugs).

Compounds used as medicines are most often organic compounds, which are often divided into the broad classes of small organic molecules (e.g., atorvastatin, fluticasone, clopidogrel) and "biologics" (infliximab, erythropoietin, insulin glargine), the latter of which are most often medicinal preparations of proteins (natural and recombinant antibodies, hormones,etc.). Inorganic and organometallic co mpounds are also useful as drugs (e.g. lithium and platinum-based agents such as lithium carbonate and cis-platin as well as gallium).

In particular, medicinal chemistry in its most common practice —focusing on small organic molecules—encompasses synthetic organic chemistry and aspects of natural products and computational chemistry in close combination with chemical biology, enzymology and structural biology, together aiming at the discovery and development of new therapeutic agents. Practically speaking, it involves chemical aspects of identification, and then systematic, thorough synthetic alteration of new chemical entities to make them suitable

for therapeutic use. It includes synthetic and computational aspects of the study of existing drugs and agents in development in relation to their bioactivities (biological activities and properties), i.e., understanding their structure-activity relationships (SAR). Pharmaceutical chemistry is focused on quality aspects of medicines and aims to assure fitness for purpose of medicinal products.

At the biological interface, medicinal chemistry combines to form a set of highly interdisciplinary sciences, setting its organic, physical, and computational emphases alongside biological areas such as biochemistry, molecular biology, pharmacognosy and pharmacology, toxicology and veterinary and human medicine; these, with project management, statistics, and pharmaceutical business practices, systematically oversee altering identified chemical agents such that after pharmaceutical formulation, they are safe and efficacious, and therefore suitable for use in treatment of disease.

Medicinal chemistry is by nature an interdisciplinary science, and practitioners have a strong background in organic chemistry, which must eventually be coupled with a broad understanding of biological concepts related to cellular drug targets. Scientists in medicinal chemistry work are principally industrial scientists, working as part of an interdisciplinary team that uses their chemistry abilities, especially, their synthetic abilities, to use chemical principles to design effective therapeutic agents. The length of training is intense with practitioners often required to attain a 4-year bachelor's followed by a 4-6 year Ph.D. in organic chemistry. Most training regimens include a postdoctoral fellowship period of 2 or more years after receiving a Ph.D. in chemistry making the length of training ranging from 10-12 years of college education. However, employment opportunities at the Master's level also exist in the pharmaceutical industry, and at that and the Ph.D. level there are further opportunities for employment in academia and government. Many medicinal chemists, particularly in academia and research, also earn a Pharm.D (doctor of pharmacy).

CHEMISTRY IN EVERYDAY LIFE

Fun Facts about Chewing gum to chew on

Chewing gum is one of the oldest sweets known to man beginning as a chewy tree sap from the Mastiche trees of ancient Greece. Across the world even the Mayans of South America liked chewy treats. It was in the 1800s that entrepreneur John Curtis introduced chewing gum to the US with his small sticks of "Maine Pure Spruce Gum."
Chewing gum has its own benefits. In fact, during the World War I soldiers were given gum to relieve stress and improve concentration. Today, chewing gum even helps to keep your teeth healthy with antibacterial agents.

The first chewing gums

The original sap based gums were replaced by gums made from paraffin wax, the same stuff used to make candles. Then, was it like chewing candles? No, sugar was added to these gums to give it an added sweetness. But the problem was that these gums were not chewy enough. The solution - Chicle, a natural rubber sap from the Sapodilla tree of Central America. This gave the gum the chewy feel. Chicle was later popularized by General Santa Anna.

The invention of modern chewing gum

Inventor Thomas Adams discovered that heating Chicle and mixing it with flavour and sugar produced a new gum. He then realized that this was much better than paraffin based gums. What made this sap special was that it was very soft. It was softer than rubber used in rubber bands, and got even softer in the warmth of the mouth. He also discovered that if you froze Chicle, it became hard. These unique properties made it the ideal choice for chewing.

How is it made?

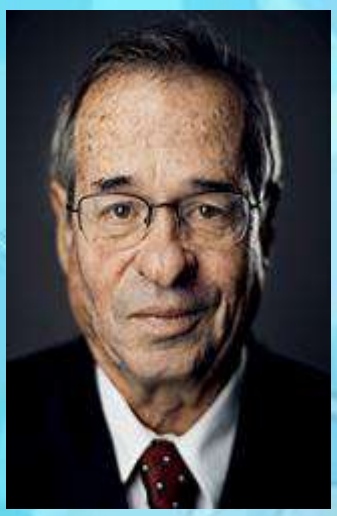
Chewing gum is made by heating gum to 115 degrees C until it becomes thick syrup. This is filtered, refined and put into a mixing vat. Then, other ingredients like sugar, corn syrup, softeners and preservatives are added. This mixture is then cooled and cut into the final bits of gum, ready to be packed and sent to stores.

NOBEL LAUREATES IN CHEMISTRY

Martin Carplus, Michael Levitt, Arieh Warshel (2013)

Martin Carplus

Michael Levitt



Arieh Warshel

The Nobel Prize in Chemistry 2013 was awarded jointly to Martin Karplus, Michael Levitt and Arieh Warshel "for the development of multiscale models for complex chemical systems".

Chemists used to create models of molecules using plastic balls and sticks. Today, the modelling is carried out in computers. In the 1970s, **Martin Karplus**, **Michael Levitt** and **Arieh Warshel** laid the foundation for the powerful programs that are used to understand and predict chemical processes. Computer models mirroring real life have become crucial for most advances made in chemistry today.

Chemical reactions occur at lightning speed. In a fraction of a millisecond, electrons jump from one atomic to the other. Classical chemistry has a hard time keeping up; it is virtually impossible to

experimentally map every little step in a chemical process. Aided by the methods now awarded with the Nobel Prize in Chemistry, scientists let computers unveil chemical processes, such as a catalyst's purification of exhaust fumes or the photosynthesis in green leaves.

The work of Karplus, Levitt and Warshel is ground-breaking in that they managed to make Newton's classical physics work side-by-side with the fundamentally different quantum physics. Previously, chemists had to choose to use either or. The strength of classical physics was that calculations were simple and could be used to model really large molecules. Its weakness, it offered no way to simulate chemical reactions. For that purpose, chemists instead had to use quantum physics. But such calculations required enormous computing power and could therefore only be carried out for small molecules.

Nobel Laureates in chemistry took the best from both worlds and devised methods that use both classical and quantum physics. For instance, in simulations of how a drug couples to its target protein in the body, the computer performs quantum theoretical calculations on those atoms in the target protein that interact with the drug. The rest of the large protein is simulated using less demanding classical physics.

Today the computer is just as important a tool for chemists as the test tube. Simulations are so realistic that they predict the outcome of traditional experiments.

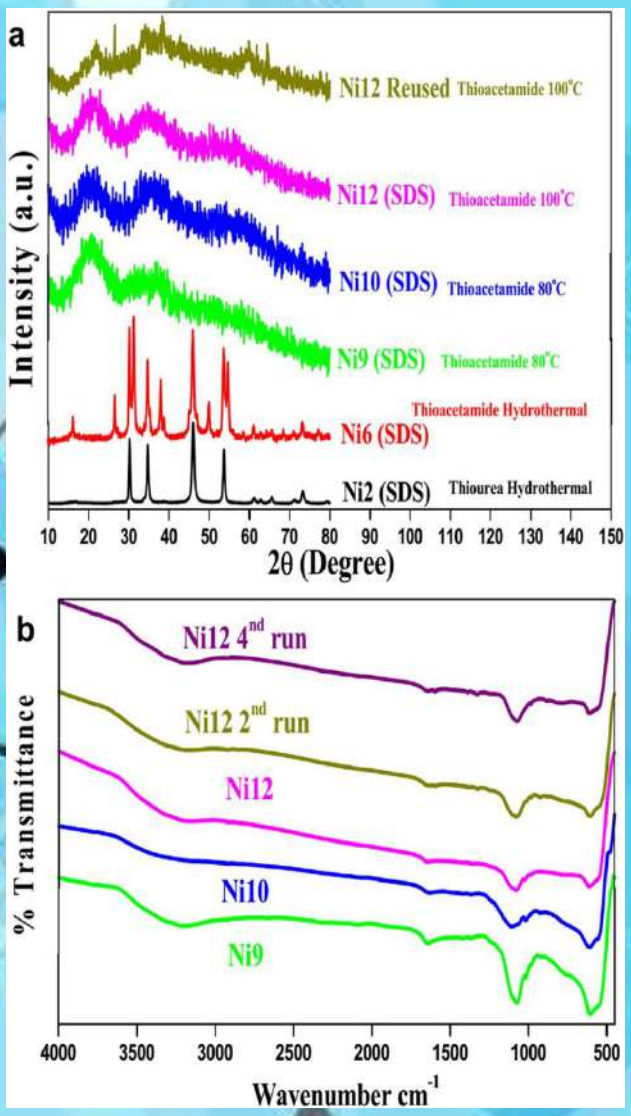
RESEARCH BY PROFESSORS

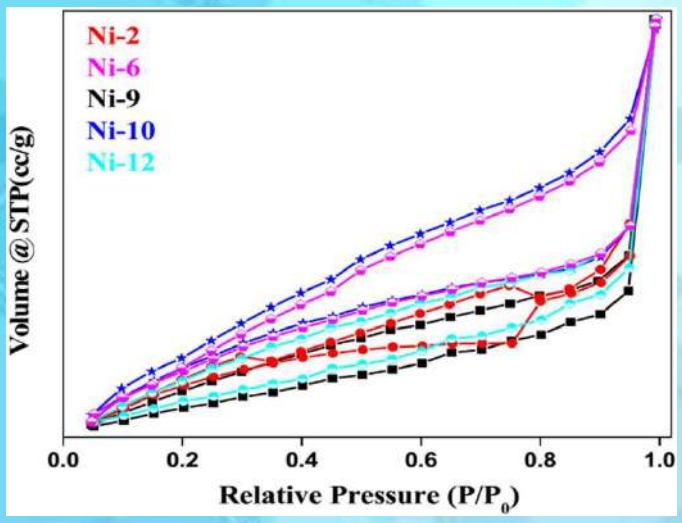
Synthesis of Tunable Band Gap Semiconductor Nickel Sulphide Nanoparticles: Rapid and Round the Clock Degradation of Organic Dyes

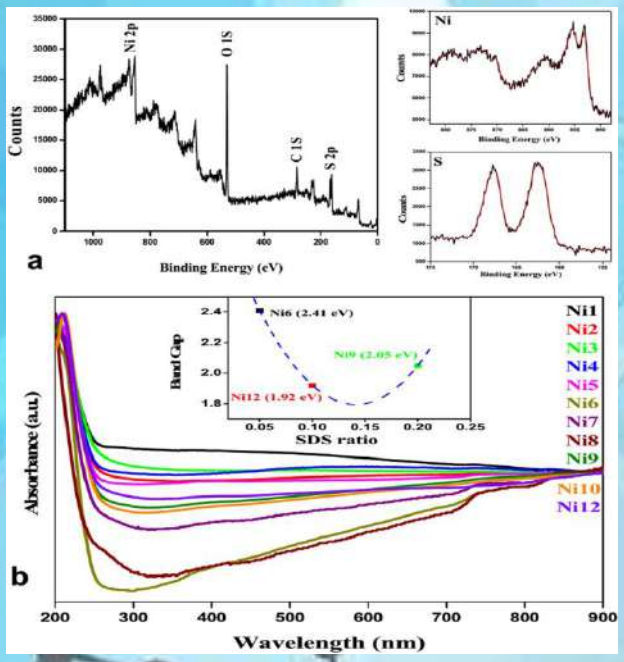
This is one of the research work of Associate Professor Sahid Hussain and his scholars Aniruddha Molla and Meenakshi Sahu.

Abstract

Controlled shape and size with tuneable band gap (1.92–2.41 eV), nickel sulphide NPs was achieved in presence of thiourea or thioacetamide as sulphur sources with the variations of temperature and capping agents. Synthesized NPs were fully characterized by powder XRD, IR, UV-vis, DRS, FE-SEM, TEM, EDX, XPS, TGA and BET. Capping agent, temperature and sulphur sources have significant role in controlling the band gaps, morphology and surface area of NPs. The catalytic activities of NPs were tested for round the clock (light and dark) decomposition of crystal violet (CV), rhodamine B (RhB), methylene blue (MB), nile blue (NB) and eriochrome black T (EBT). Agitation speed, temperature, pH and ionic strength have significant role on its catalytic activities. The catalyst was found to generate reactive oxygen species (ROS) both in presence and absence of light which is responsible for the decomposition of dyes into small fractions, identified with ESI-mass spectra.







For full text :
https://www.researchgate.net/publication/303304210_Synthesis_of_Tunable_Band_Gap_Semiconductor_Nickel_Sulphide_Nanoparticles_Rapid_and_Round_the_Clock_Degradation_of_Organic_Dyes

THC EVENTS IN ANWESHA

ANWESHA is around the corner and like every other club in our college ,THC too is highly involved in the fest. This year THC is organising 3 events which are ROCKET PROPULSION, ARE U UPDATED and CHEMOQUEST. The details of each of these events are already uploaded on the ANWESHA site. Interested ones can register from here too.

Link for ROCKET PROPULSION : http://2017.anwesha.info/#event56

Link for ARE U UPDATED: http://2017.anwesha.info/#event55

Link for CHEMOQUEST: http://2017.anwesha.info/#event73

Q & A ZONE

Welcome back readers!! Here we are with another internship experience of someone who is really hardworking. From bringing participations in fest to getting cool internship , she is perfect in everything. Yes, I am talking about Ms. Bhagyashri Verma (Pre final year student) who shared with us her internship experience in a small chat with us.

ThC: Please tell us a little about the industry where you were enrolled as intern.

Bhagyashri :I was a summer intern in Marico Ltd. Marico is an Indian consumer goods company providing consumer products and services in the areas of Health and Beauty based in Mumbai. During 2015, the company generated a turnover of over Rs. 5000 crores .The organisation holds a number of well known brands including Saffola, Hair&Care, Mediker, Livon, Set Wet, Zatak but the most famous among them the Parachute oil. I was working in Research & Development section of the company which is only present in only one location in India, i.e., Mumbai.

ThC: What was the work given to you by them? How did you managed to completeit?

Bhagyashri : Actually to be honest, being a sophomore I had a very little knowledge about what a chemical engineer do, so I was a bit sceptical about so as to what project should I pursue. The project that I proposed initially was to work on freezing of parachute oil in winters. But after going there and interacting with various stakeholders in the lab, I got to know what projects were going on in the company and how relevant they were to my curriculum. So, I dropped the earlier project. I told my mentor that I need to work on project that gives me the maximum lab experience and in the end after a lot of discussions and research, the project that I worked upon was “Surfactant solubilisation of proteins and classification of shampoos from mild to harsh-

zein test". I managed to complete it with just breaking a cuvette and spilling dye on weight balance; other than this it was an easy task which just required efficient lab work.

ThC :How is an industrial intern different from that of the research one?

Bhagyashri : Industrial or Research? Well, it has been the question of the century for a while now. But for me, my industrial intern was not much different from research one. As I was working in the R&D lab of the company, it gave me all the experiences of a research intern plus the added benefits of being an employee for a company. It was quite similar to a research intern as it included an exhaustive reading of papers, books and other materials like a research intern but at the same time it gave me a cordial & open work environment conducive to learning & taking risks coupled with ample opportunities to innovate and contribute in live industry projects.

ThC : What were the diggings you did about the companies while applying?How did you approached the company for internship?

Bhagyashri :While scouting for the intern, I interacted with my batch mates, seniors and my branch HOD and asked them what options do we have. After making a comprehensive list of FMCGs, I started researching about the companies. After a lot of discussions I selected Marico Ltd. as this company also took interns in R&D section and it is one of the fastest growing FMCG. It is known to have a good work environment. The company also gives people opportunity to make a difference by being their own leader. I , then, approached the company through LinkedIn sending invites to around 20-25 people from company and on acceptance dropping a message to them. After that I got contacts of the HR department from where I took it forward via the emails and telephonic conversation.

Did the internship helped you in learning? If yes, in what ways?

'Swimming is not learnt in the classroom' – I firmly believe in this saying. And Marico Ltd. gave me the chance to learn by doing in a setting where I was

supervised by a work-place professional. I also had the opportunity to achieve my own learning goals, without the responsibilities of being a permanent employee. Apart from the academic learning, It helped me in learning how to handle work pressure, office politics and gave me apt experience of working in an industry lab.

ThC : Some suggestions for your 'beloved' juniors!!

Bhagyashri :Be active and try harder, don't get disappointed by small failures and never let misconceptions hamper your motivation. While it is expected of an intern to commit a few mistakes, we don't term them as mistakes per se, but as learning experiences. In an industrial intern, you are expected to:

1.Shift from campus to a corporate mindset.

2.Relinquish fixated, rigid ideas and instead harness your learnings from the organization.

3.Be open to explore the wider work environment by interacting with various stakeholders.

To culminate, I just have to say this – Live your time, enjoy every moment, study a bit, learn a lot, and as the saying goes– "Learn something of everything and everything of something."

ThC : We are really thankful to you for sparing some time for us from your busy schedule and wish you the best for your future.