

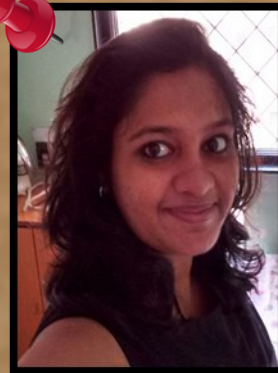
EDITORIAL TEAM



RIA DARNE



OINDRILA DE



RACHEL AGERA



SMRITI VASWANI



SINI PORATHOOR

SPECIAL THANKS TO

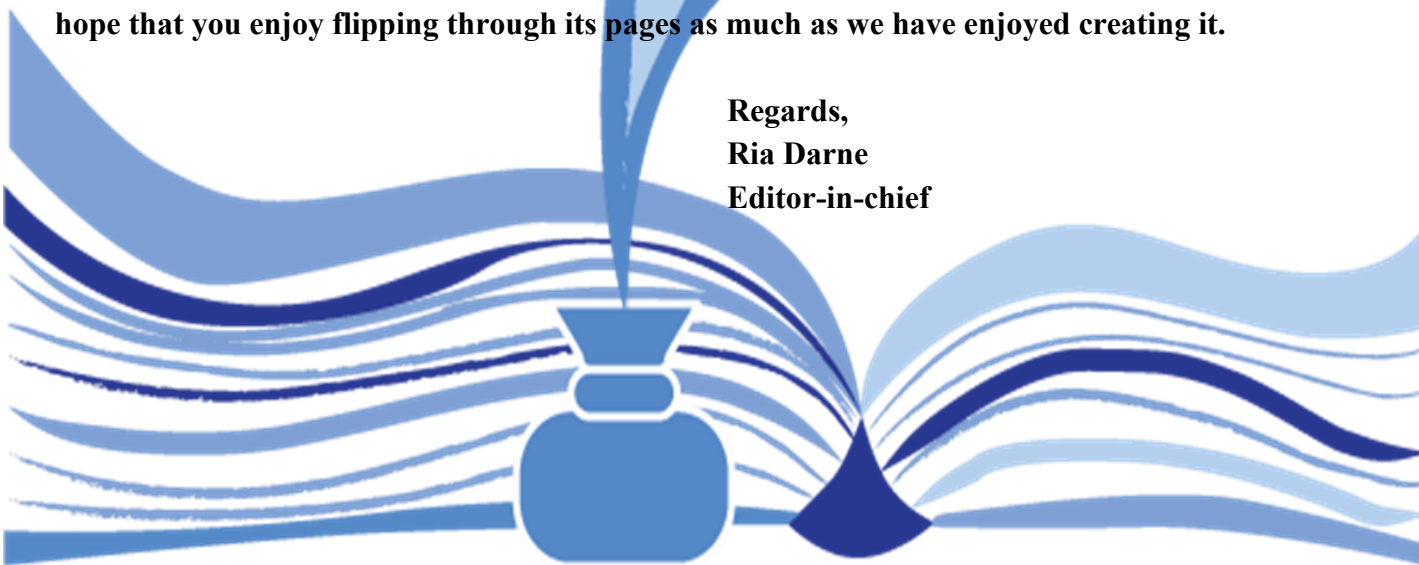
Dear Readers,

With the aim of finding one's niche, the Post Graduate Department of Biotechnology at St. Xavier's College-Autonomous Mumbai, designed a lucrative experiment taking into consideration our creative ideas as the raw materials and compiling as the sole methodology. This experiment resulted in the birth of the Palindrome magazine and it was indeed a 'Eureka' moment. Our beloved department truly believes in young and impulsive minds like ours and we are grateful for having given us this opportunity to express maximally our views which were otherwise dormant. And the legacy continues this year too!

To have a balance between curricular and extracurricular activities, an intercollegiate annual festival Palindrome was born which is an educating experience with just the right amount of fun. This magazine reflects and thereby exemplifies the daunting but delightful and entertaining but educating expedition of our festival. Besides that, this issue throws light on the Indian scenario of Biotechnology, the field in which we are establishing our roots. We also share life experiences of some of our friends who are already out in the market, striving day in and day out to contribute to their own careers and thus contributing to society.

The experience of contemplating, concising and compiling the content for this collaboration of thoughts and creativity has indeed been enriching. We extend our heartfelt thankfulness to our dear professors who supported and motivated us from the very commencement to the completion of this journey. All views expressed by the authors are either compilations from referred articles or personal. We hope that we broaden your horizons of knowledge with this magazine and also hope that you enjoy flipping through its pages as much as we have enjoyed creating it.

Regards,
Ria Darne
Editor-in-chief



FROM THE EDITOR'S DESK



OUR HERITAGE

St. Xavier's college, Autonomous- Mumbai, founded in 1869 by the Society of Jesus is a Christian religious organization started by St. Ignatius of Loyola and named after St. Francis Xavier. Since the year 2010, the college has been granted Autonomous status. In the third cycle of assessment in 2013, NAAC has accredited the college with an A grade (3.63/4 GPA). The UGC conferred upon the college the coveted award of "College of Excellence" in 2014. In 2015, our college has received the DBT Star College award.



OUR DEPARTMENT

The mission statement of the Post Graduate Department of Biotechnology is to ignite young minds in a manner that establishes a strong foundation for understanding of the field of Biotechnology. It also aims to develop technical and critical thinking skills necessary for success in the field, to foster ethical behavior and to promote outreach. Academic autonomy has given the Department an opportunity to incorporate the current advances in this field in the syllabus thus creating a student population that is an asset to the Biotech research community and industries. With our Head of the Department, Dr. (Ms.) Vivien Amonkar, we are blessed to have an inspiring faculty of professors- Ms. Norine Dsouza, Dr. Shiney Peter and Dr. Biswa Prasun Chatterji.

OUR PALINDROME FESTIVAL

Apart from the rigorous academic training, the department aims at developing and instilling leadership qualities among students through organization of events such as the annual intercollegiate festival 'PALINDROME.' It provides a platform for undergraduate and postgraduate students of colleges across Mumbai to showcase their talents and develop team building skills. We have a tremendous response each year, with an involvement of 250-300 participants from over 30 colleges. We have always been fortunate to have had the support of several organizations.

OUR SOCIAL RESPONSIBILITY

One of our objectives is to reach out to underprivileged children by supporting an organization called REAP (Reach Education Action Program). REAP was born out of the need to combat illiteracy and ensure that every child is in school. For millions of children out-of-school and into child labour, education is still a distant dream. Yet, it is a known fact that primary education is the key to development and that the future of the country is shaped in her classrooms. Through a dynamic vision, grass root commitment and an aggressive yet innovative approach, it has set on a task of social transformation through 4 E's – education, entitlement, employment and empowerment. It aims to open up a new world of education to children from slums and rural areas. We contributed in this movement by selling handmade crafts at our festival and collected money for the same.



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PALINDROME DIARIES

It was an ordinary day at St. Xavier's College Autonomous Mumbai on the 11th of February '15 and yet PGDBT experienced an extraordinary event- Palindrome. Apropos to our motto- "Provocans Ad Vollandum", we imagined to plan, we desired to perform and we created to progress. It being the 6th year, we were successful in bringing together 232 enthusiasts from 16 colleges across Mumbai and providing them a platform to plan, perform and progress.

With seven events and two workshops in total, the day was packed with new experiences and learning skills with just the right amount of fun. The day ended with the prize distribution ceremony and the college that bagged the overall trophy was SIES, Sion.

It is very truly said that every day of our life is made up of two things; Receptivity and Productivity. We as creatures are constantly in the process of intake and output. We absorb and we exude. The question is what will it be? Answer to which was very clear, each one of us had taken in a lot and put out tremendously.

So bless those, who challenge us to grow, to stretch and to move beyond the things already known. Because those who challenge us, remind us of the doors we have closed and doors we are yet to open. Although this door is now closed, I'm sure we all have many more opportunities to come. For me this department is like an extended family now.

-RIA DARNE

PRESIDENT, PALINDROME '15



NEUROSCORA

"The little grey cells on which you rely, will score you good, if you try. Madness of the nerves will give you the zeal, unveiling is what you may then feel. So charge your neurons to fill in the gaps and the prize is yours if you cross this synapse."

As involuntary as blinking eyes is, we believe that gaining knowledge should be involuntary too. That one event, which is mandatorily a part of any festival of Science, was a part of ours too and it was called as Neuroscora. Mr. Prajith Nambiar, Assistant Professor of Biotechnology Dept. from S.I.E.S College, Sion was invited for moderating this event. Multiple rounds of PR and past experiences based word spread made enormous entries for Neuroscora but only few lucky teams could pave their way for further rounds after eliminations. The second round included a display of various images scanned out from various biology

books; these images possessed a link and any sentence describing the link was expected from the team. In the final round, each team was asked a set of questions which eventually helped them, if correctly answered, to reveal a part of the many hidden parts of an image. A final question was asked based on the hidden image and points were credited or debited accordingly. The winners were announced and lots of pleasing prizes including Trophies and many accessories were awarded.

A team from S.I.E.S College bagged the first prize and runner ups were also gifted so as to kindle a never ending fire for such events and to keep up the competitive spirit. As the event head, I would always be thankful to the small family of MSc 2015 for their help and wishes, especially my team of Neuroscora and our professor Dr. Biswaprasun Chatterji for a successful event in Palindrome 2015.

VINEETH DANIEL

EVENT HEAD



ENTERO- PRENEURSHIP

"Then you realize there is a formal process to business. It is not just doing something in an ad hoc way. There is a rationale to what you have to do. There is a strategy to what you do and so you slowly, sort of, learn on the job."

This inspired our event and the one rationale behind it was- A product made by you, it must be eco-friendly and new, can you market it too? The most challenging yet learning event in Palindrome 2015 is what we are talking about here- The Entero-Preneurship Event! This event was all about a platform to showcase the skills that a young entrepreneur holds. This year, the theme was 'Agricultural Biotechnology'. The participants were to think on lines that will help boost the agricultural biotechnology sector and maximize food production in the country.

Our judge was Ms. Karuna R. Gokarn. We had a participation of 12 pairs competing for the grand prize. The event tested the writing, planning and execution skills of the participants in the first round. A case study was given based on the problems faced by agriculture in. The second round was all about creating a hypothetical novel product that would prove to be a solution for the aforementioned case study.

The two teams that left our judges spell bound were then challenged to hold a debate and put forth the superiority of their product along with their marketing strategies. The winners were Jay Doshi and Sheherazad Pavri from Jai Hind College who won a cash prize of Rs. 2000/- along with a trophy. This event was indeed challenging at every step, it being a hunt for the Young Entrepreneur through Palindrome 2015.

RACHEL AGERA
EVENT HEAD



FINDING PNEUMO

"You have to take a flight in a fright for this fight, to be quick as a flash and get it right. The burst of adrenaline will propel you to a successful finish, better be impromptu or you'll diminish. So look up, look down and search all the way around. Put on your investigative caps to clear the next round."

This was a task of solving a murder mystery. Not only were the participants expected to reach to the final piece of evidence to unfold a mystery but also have deduction skills like that of the famous- Sherlock Holmes. Participants ultimately had to find out who the real killer was and give evidence, of course, to support their allegations. We had 44 teams participating each team consisting of 3 members. The first elimination round involved finding answers to crosswords, jumbled words and word search within a time limit of 10 minutes. The top 13 teams were selected for the final round which was the murder mystery.

The chase began around the college campus, for the clues. After collecting all the clues, they had to identify the murderer with evidence. The clues were tricky, the mystery was messy and yet all the participants enjoyed the chase. The entire run throughout the big and the beautiful college campus that we have, was really exciting and adventurous for the participants as well as for our volunteers. The teams that emerged as winners were: Seher Sayed, Vaishnavi Parmar, Muntaseer Abbas from Jai Hind College while the runner ups were Rachita Rao, Shailesh Shetty, Habiba Shaikh from SIES College.

We thank our volunteers and faculty members for their assistance. Setting up such an event which is always anticipated by all is no easy a task. We hope the audience enjoyed our event as much as we did creating, organizing and executing it.

KANKSHA MISTRY
EVENT HEAD



MIGRAINE

"It might be a pain but you got to rack your brain. Better be the jack of all trades, or you'll be down with a migraine! A series of mind challenging games, simple yet new; specially designed to test the laboratory skills in you!"

Migraine 2015 lived upto its name yet again giving another powerful and throbbing headache to about 54 teams from different colleges all over Mumbai. Since our event was a cascade of fun filled mind boggling games, the name is apt for this event. With this exciting game, we aimed at making science more interesting, fun and creative. This team based event consisted of 3 levels. The first level comprised of 14 riddles to be solved in merely 10 minutes. Only 15 teams went through the next round of physical tasks, memory game and puzzle solving.

Last but not the least was the guessing game in the final round, with only 5 lives and a time limit. The participants were racking their brains throughout the course of the event where every minute they caught themselves competing to be the best. One has to be not only good but the best, in order to claim victory. The apotheosis of this event was when S.I.E.S was declared the winner as well the runner up of Migraine 2015.

We thank our participants without whom this event would have been nothing. Also, we thank our professors who were always around during the entire event making sure nothing went wrong. Paining excruciatingly, Migraine ended leaving behind enough memories to wait a year for the next headache.

HEMANI SUVARNA
EVENT HEAD



INKFLUENZA

"Words are the most inexhaustible source of magic, be it comic or be it tragic. To bring out the storyteller in you, Inkfluenza is here ado. So enthrall like Christie and like Shakespeare you think. Use your weapon and let the words flow in ink!"

Inkfluenza, the exclusive creative writing event of Palindrome aims at providing a platform for budding writers and story tellers to showcase their talent. The day-long event witnessed a total participation of 37 students from various colleges across Mumbai. Equipped with their most powerful weapon, their pen, the event witnessed the participants eager to battle it out on paper in what may be deemed as -A War of Words. The topic for the event was - 'How would it be if experimental animals could speak?' The format of the event permitted the participants to express their views in either the form of a story,

poetry or dialogue form within a time limit of 30 minutes. The thoughts on the topic ranged from comical to solemn with many of them urging sensitization to experimental models through their words. The judge for the event, Mr. Conrad Cabral, was all praises for the participants for their profound views and thoughts and the impressive amounts of creativity displayed by the participants on elaborating on a hypothetical yet thought provoking topic. Of the various colleges that were a part of this event, Mithibai College and Jai Hind College emerged victorious with the colleges securing the first and the second position respectively. The winners were awarded with trophies in addition to a number of prizes. We are thankful to our volunteers to help us out with the entire event. We are grateful to all the participants who showed great thrill in expressing themselves through this event.

NEEDA NASIR
EVENT HEAD



ARTEMISM

The desire to imagine and create is one of the deepest yearnings of the human soul. So get ready with your expertise to explore biotech as a whole. Choose your hues from nature's pallet and show us how you execute your creative intellect."

The most artistic event of Palindrome 2015 – Artemism with the theme, 'Biotechnology – From Lab to Life' comprised of a single round wherein the participants were provided with a handmade paper bag [26 X 21cm] as a canvas. They were expected to make a drawing by imprinting with biodegradable or any waste material of their choice within a time limit of 1 hour. Ice cream sticks, vegetable peels, cotton were some of the materials used by the participants for painting. The ability of the participants to comprehend the theme and to replicate their imagination in a way that would be both meaningful and aesthetically pleasing to the eyes, was the most important factor which

altogether contributed to the success of the event. A total of 18 teams i.e. 36 participants from different colleges were given ticket to enjoy this artistic event. The judges Ms. Norine D'souza and Ms. Gulshanara Shaikh lightened up the event and the spirits of the participants.

Creativity, imagination, colour combination, neatness, time limit were the factors taken into consideration for judging. It was the team from K. C. College, Rohit Halder and Anjali Mer who stood tall and the team from Royal College, followed the victory path and stood second. We are extremely thankful to the volunteers from the Microbiology Department who helped us. Also we thank our participants without whom this event would not have transpired to be a success.

SHRUTI PAGARE

EVENT HEAD



ACT-IN-A-MIGHT

"With a mish-mash of melody and melodrama, put music to motions when you face this dilemma. Put your thinking caps back on, as you might have to con. Be sly as a fox or just think out of the box!"

This was the drama event where actions spoke louder than words. We all know the world of reality has limits, but the world of imagination has no boundaries and this event focussed on triggering the youth's imagination in the field of biotechnology. The participants were given biotech related topics and were expected to enact them with the help of some Bollywood background music. Students from various colleges across Mumbai participated in the event in groups of 5. The enthusiasm to compete and win among them was evident through their outstanding performances. Participants showed how a biological concept can be beautifully described using a Bollywood twist.

Along with the talented participants and audience, our judges – Dr. Pampi Chakrabarty and Ms. Julia Chelliah graced the event. A total of 7 teams i.e. 35 participants from different colleges participated in the event. The topics for the event were BIND ME MAY BE, LACTOSE OPERON and PAGE. Ideas, ingenuity, resourcefulness, artistry, imagination and time limit were the factors considered for judging. The event was daunting. To be crystal clear about the concept of the topic and to be able to portray it well to the judges and audience is a big task. However, acting it out wasn't at all difficult for the drama queens and kings in the house. Both first and second positions were secured by participants from SIES College who showed their zeal for victory. The success of ACT-IN-A-MIGHT wouldn't have been possible without the assistance offered by volunteers from the Microbiology Department and of course, our professors.

SWATI SINGH

EVENT HEAD



THE CODE

"Welcome to the world of bioinformatics, where you'll learn some new tactics. The code you may not know but how to decode, we will show."

Now commonplace, Bioinformatics studies bring new challenges that are likely to increase as genomic technologies enter the clinic and spawn even tougher data-generation-to-data-analysis issues. To overcome all these barriers faced by the students in today's world, a debut workshop – 'The Code' was organized. The Code was conducted by the top faculty of the department, Ms. Norine D'souza, along with a student organizer, Lino Philip. The workshop allowed students explore the world of bioinformatics, genomics and proteomics. The size limit was up to a maximum of 25 students to ensure individual attention; it was spread over a period of 2 hours.

The idea behind this effort was to create a dynamic environment that captures the ever-changing nature of bioinformatics and incorporate resources that can be used within the context of the Curriculum. The workshop trained the students with the latest approaches used in computational biology to deal with the new data and its application in field of biology. Topics included genome rearrangements, genome visualization, gene function prediction, functional annotation, protein visualization using Rasmol, identification of nucleotide and protein sequences using BLAST, etc. The A wide scope in the field of bioinformatics was opened by the faculty. The students enjoyed every minute of the workshop. A hearty thanks to our faculty as well as the volunteers who took an active part in introducing each participant to the world of bioinformatics.

**KOMAL SHAH VICE PRESIDENT,
PALINDROME '15**



CRIMES AND CLUES

*"The city is full of crooks and crimes.
To witness, to solve cases, we prime.
Physical evidence awaits your detection.
Can you reconstruct a crime scene with your
predictions? So trust your deduction and
basic instincts and come learn the science
for forensics."*

This year the workshop was conducted by forensic experts, Ms. Sejal Shah and Ms. Alok of the Department of Forensic Science and Zoology at St. Xavier's College. The workshop aimed at allowing students explore the world of forensic science by securing a crime scene, gathering clues and processing evidence. The workshop was limited to a maximum of 60 students to ensure individual attention.

The main purpose was to develop analytical thinking and problem-solving skills in the context of intriguing and sometimes surprising evidence in these young forensic minds. It started with a crash course in forensic science techniques, such as studying blood spatter and identifying fingerprints. The practical part was a thrilling experience for each of the participants.

Six teams of six students each were asked to solve a murder mystery through identifying and matching a series of samples like blood, hair, fingerprints, handwriting, etc. with the normal ones. By the end of the workshop, each and every participant aspired to be future CIDs. A hearty thanks to our forensic experts and the volunteers who took an active part in inculcating an aroma of crime scene solving within the participants.

**KOMAL SHAH VICE PRESIDENT,
PALINDROME '15**

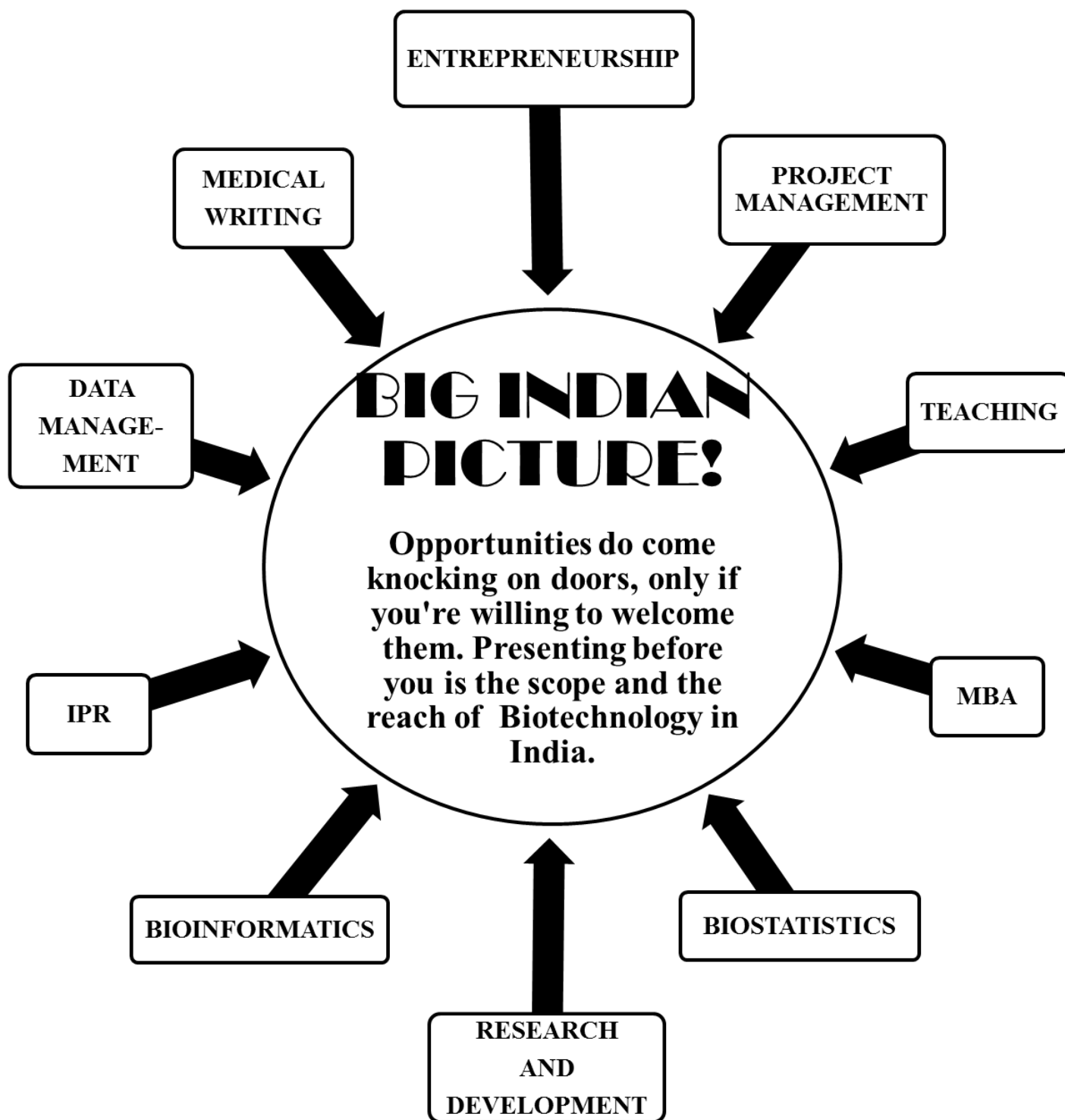


SHRUTI PAGARE

MSC PART II, 2015-16

I want to be a Biotechnologist!

**I want to be a Biotechnologist,
I want to own a lab,
I want to master science,
You might think I'm mad.
I want to use a microscope,
And win many awards,
I want to count the colonies,
And study different laws.
I want to study Bioinformatics,
I want to use BLAST,
And compare the protein sequence,
Well I know it's quite vast.
I want to work with animal culture,
And do the cytotoxicity testing.
Using different assays,
To check the cell cycle arresting.
I want to write review articles,
And give scientific presentations.
I want to work for Palindrome,
Relentlessly, without a cessation
I won't enjoy doing a sedentary job,
Warming the seats all the day.
I want to be a biotechnologist,
A biotechnologist all the way!**



INDIA INSIDE

“Generalists” or the “Jack of all trades, master of none”, is what students graduating with a Biotech degree are been referred to as. Little do they know that since biotechnologists are jacks of all trades, they can be master of many! Generalists have an upper hand as compared to as the Specialists in the sense that the latter have experimental blinders put on while the former experiment broadly. The country is forgetting the contribution of this field in sectors of agriculture, pharmacy and industries. Often referred to as the sunrise sector of India, Biotechnology is making slow yet steady progress with time. The Biotech industry can be categorized as Bio-services, Biopharmaceutical, Bio-agriculture, Bioinformatics and Bio-industrial. With this growing scope and reach, employment in the nation is growing too. Not only research institutes but also corporates are now undertaking large-scale employment of graduates with such a multidisciplinary background. Some major institutes and organizations employing students are represented here.

BIO-PHARMACEUTICAL

Shantha Biotech, Serum Institute, Bharat Biotech, Dr. Reddy's
Lab, Wockhardt, Biocon

BIO-SERVICES

Syngene International, Lambda Therapeutics,
Quintiles

BIO-AGRICULTURE

Ankur Seeds, Mahyco, Rasi seeds

BIO-INDUSTRIAL

Novozymes, Praj, Richcore

BIO-INFORMATICS

Cellworks,
Cognizant,
Infosys,
TCS

To say, India has just spanned the lag phase of the biotechnology growth curve and has now invaded the log phase. This phase is crucial since now is the time where the field requires more support, research and investment. The future of Biotechnology, is thus, interesting and intriguing but challenging.

RIA DARNE

MSC PART II, 2015-16

L A N G U A G E & S C I E N C E

It has always been said that a person can join either of the following two professions: medicine or engineering. However, some students may either opt out of the rat race by choice or would be forced to opt for other options when things do not work out. Well, I am a hybrid between the two of the abovementioned options. I decided to pursue biotechnology. However, there seemed to be only one big option if I had to make a career out of biotechnology: pursue research and obtain a PhD. I started moving in that direction, but I began to understand that biotechnology, and in fact science, is more than just research. It was finally in Xavier's where I finally decided that I wanted to pursue a job in editing and that is why Xavier's is my home because it helped me understand more than what books may teach. It helped me truly understand science.

I joined Crimson Interactive Pvt. Ltd. in August, 2014. Our company is one of the leading players in the Science, Technology, and Medicine (STM) industry in the world. It has been a little over 9 years since the inception of this company. We cater to countries where English is not the primary language. We have three brands under us: Enago (editing), Ulatus (translation), and Voxtab (transcription). I work for the Enago department. We edit articles right from biosciences to medicine to arts & humanities to commerce & law and even love letters!! I have thoroughly enjoyed myself at this company. Each day brings new challenges and new things to learn. I have been able to learn so much about research that goes on across the world. I feel privileged because most of the times I may be the first person apart from the author and his/her team to have a glimpse of the research conducted.

One needs to understand that editing is more than grammar and language correction. It is an interplay between language and science (in my case). It is always essential to maintain the original expression of the author while editing because too much focus on only language can lead to mishaps in research.

It has been a fulfilling experience thus far, and I look forward to an enjoyable journey ahead. Before I end, let me assure you that a career in science is not dull and it will not be looked down upon. Research is not the last and only option. It all depends on an individual's interest. Search yourself and find out what will bring you the most satisfaction and joy. If it is research, pursue it. If it is a data analyst, pursue it. If it is an editor, pursue it. Do not set ordinary goals, push yourself to achieve and be the best. Let me conclude by sharing the most important principle that I have learnt as an editor: Learn more, achieve more, strive for more!

NIKHIL THANGIA
ALUMNUS 2013-14

LIFE AT MAHYCO

The biotechnology industry is one of the fastest growing sectors in India, linking the health and agricultural sector. Bio-Pharmaceuticals is the largest sector in India with almost two-thirds market share of the biotech industry. I have been fortunate enough to have worked in one of the largest biotechnology companies in the country - Maharashtra Hybrid Seeds Company Ltd. (Mahyco) at Dawalwadi, Jalna. Dr. BiswaPrasunChatterji, one of my professors in St. Xavier's PG Dept. of Biotechnology, convinced me to apply to the company for my MSc dissertation project citing its excellent infrastructure for plant biotech research I worked towards deciphering molecular diversity using marker-based analysis in which 8 wheat genotypes were studied for their diversity using 150 microsatellite (SSR) markers. The basic idea behind the project was to find out genetic diversity among the Wheat varieties. At first glance, the project given to me looked extremely complicated since Wheat has a hexaploid genome and hence will contain 6 alleles for most of the markers. Additionally, around 1200 PCRs (8 genotypes x 150 markers) would be required along with gel electrophoresis to complete the diversity screening!! This was of course just the experimental part; I also had to do field work for a week to get young leaves of the plants for DNA extraction and of course the statistical and analysis part. The excellent guidance of Dr Anshuman Tiwari and Dr Venugopal Mikkilineni and the infrastructure available at Mahyco made it easier for me to finish all the work well in advance.

Mahyco experience left me with many memories in addition to an amazing exposure to the world of Biotechnology research in the industry. However, I also realised the gulf in the research and practical aspect of Biotech between the colleges and the industry. There is a significant gap in the theory that is been taught at the college level and the current research practices employed in the industry. It is of utmost importance that these gaps should be bridged with appropriate research exposures at the college levels itself. St. Xavier's PG Dept. of Biotechnology has been striving hard to bridge the gaps. The three research projects, one of which were presented at the DBT National Conference in Pune, are testimony to the emphasis put by the department on the process of "Critical Thinking". The biotech industry in India has a bright future however it is necessary to train our capable workforce towards it. Biotechnology requires skills and extensive hands-on training in different techniques. It is, hence, important for the colleges and university departments in our country to make minor research projects mandatory to increase the quality of education and train the students in an industry-dependent manner. We must ensure that Biology teaching programmes are interdisciplinary and provide a wholesome knowledge; eventually making the students capable to apply the knowledge for the betterment of mankind

NIKHIL BARDESKAR

JRF, NIRRH. ALUMNUS 2013-14

My tryst with research began when I joined the Department of Biotechnology at St. Xavier's College, Mumbai in the year 2012. Being completely unexposed to the several nuances that go into the making of a research student, I faced many a road blocks including temperamental career options where at a particular point I even thought of quitting the course. Gruelling, demanding and at times frustrating, the Masters of Science in Biotechnology was proving to be a ride that was going to take me places. My love affair with science began at the Advanced Centre for the Treatment, Research and Education in Cancer (ACTREC) where I interned in a Chromatin Biology and Epigenetics Laboratory under the guidance of Principal Investigator Dr. Sanjay Gupta. Being an absolute novice in the field of research, the tenacity and vigour with which cancer research was being conducted was both fascinating and frightful.

I completed my MSc thesis at the Tata Memorial Centre and returned to complete my 4th semester examination. In spite of a huge improvement in terms of marks, my GPA was an embarrassment which again led to a fleeting thought of what I call the 'pack your bags and leave' syndrome. But still the dream that I had to make it as a Biomedical Scientist kept looming in the horizon of my future. And so, I set out on the voyage to my destiny.

I was asked to join as Project Assistant under the guidance of Dr. Amit Sengupta at ACTREC (Tata Memorial Hospital), where I worked with a team on a clinical trial. This was exactly what I saw myself doing in the years to come and hence I forged ahead. After getting a good score on the TOEFL (Test of English as a Foreign Language)-115/120, the insurmountable task of selecting colleges began. Kansas University Medical Centre (KUMC) was a dream come true. It was one of the four places where I was interviewed and the only place with a substantial stipend giving a choice of fantastic subjects in Biomedicine. After my Skype call I didn't know what to expect and my patience was wearing out with time. And then the letter arrived!!!!My joy knew no bounds and the thrill of sweet ecstasy kept me in a trance for days to follow. I was finally going to be a Biomedical Scientist and be able to taste a slice of scientific discovery in the USA.

My journey has just begun. As a future scientist, I know that the obstacles to follow will be much larger than the ones before but I do hope the journey continues. So I sign off wishing everyone the best in their pursuit of academic excellence and scientific merit. I truly believe in Paulo Coelho's famous line in 'The Alchemist' that says 'If you truly want something, the entire universe will conspire to give it to you'. Give your heart to what you do and success will meet you one morning at your doorstep

CRISTABELLE DE SOUZA.

PhD Scholar, Kansas University Medical Centre.

MEDICAL WRITING

June 2014 was a month of mixed emotions! 2 years of Masters had come to an end and the future lay before me in undulating contours. I did not want to be an underpaid intellectual labourer, nor did I want to be the prodigal offspring who would choose moolah over matter. Before I could rationalize my thoughts and decode the most appropriate plan of action, I was selected for the role of a 'Medical Writer' at Tata Consultancy Services (TCS). The interview at TCS was my first ever encounter with an employer, and it also turned out to be the first instance, amidst many that followed, to make me aware of the meaningful training I had received at Xavier's. The 13 months that have passed since then have been very valuable, full of learning and excellence. My role involves writing patient narratives, which form a part of the Clinical Study Report (CSR) that is submitted to regulatory authorities, like the Food and Drug Administration (FDA), prior to receiving marketing approval for drugs.

These narratives are individual summaries of patients who experienced serious adverse events and give a detailed description of the patient demography, ongoing medical conditions and medications, onset of the qualifying event, medications used to treat the event, supportive laboratory details, resolution of the event, and the causality of the event (whether related to the study drug or not). They, thus, help in analysing the safety profile of a drug molecule intended for human use. While working on patient narratives, I have been able to utilize some bits of my Biotechnology and scientific knowledge, especially in understanding different therapeutic areas along with the mechanism of action of the drug under study, therapeutic monoclonal antibodies, diagnostic tests and their interpretation, nomenclature of microorganisms, and most notably, the knowledge we garnered on the topics of clinical research and regulatory affairs.

I have many options to optimize my combined learning at TCS and Xavier's. Regulatory medical writing is a magnanimous field, with various documents to be explored (CSR, periodic update reports, risk management plan, etc.). I can gain experience by working on different documents, opportunities for which are present in abundance in the pharmaceutical industry. However, my seniors at work have often highlighted the fact that building a career in medical writing needs to be augmented by relevant experience in the plethora of documents, more than any titular achievements. The one thing that I'm surely convinced about is that Biotechnology is not a field that should leave its takers high and dry. There are a range of options, for the research lovers, research haters, for the ones fond of writing, argument, analysis, for the ones who love to teach, and the list is fortunately endless. Let's together explore and create a better world, since we're equipped with both - roots and wings.

SHREYA BHARGAVA
MEDICAL WRITER, TATA CONSULTANCY SERVICES

BIOTECHNOLOGY AND IPR: IN THE MAKING

Proceeding towards Masters in biotechnology, this two year course delves a little deeper into every sub discipline of biotechnology and helps you appreciate the research and progress made by the subject over the past couple of years. The Master's degree makes you realize the varied applications and future prospects the subject has to offer. One of these options happens to be the budding area of Intellectual Property Law. What is this all about?

A patent is a document which provides the inventor alone, a right over his invention and protects it from infringement. It preserves the intellect of a human being and exists in various forms. A patent could take the form of a trademark, copyright depending on the nature of the invention. Along the way, I realized that it's more interesting to learn how to protect science than try to produce science. So I started actively working towards collecting information about this field. I stumbled upon a course which met my requirements, a three year L.L.B (Hons.) in Intellectual Property Law offered by Rajiv Gandhi School of Intellectual Property Law at IIT Kharagpur. What enthralled me to pursue a three year L.L.B (Hons.) in Intellectual Property Law is the common ground established by science and law by way of patents.

So this is what I think my future would look like from this point. My job profile after completion of this course would focus on assisting the scientists to protect their invention by declaring an invention patentable or non-patentable. It wouldn't be as simple as it sounds because there is lot of complexities in determining the patentability of an invention. It becomes essential to have a clear understanding of the fundamentals in science. This is where my masters in biotechnology come to my rescue. This combination of science and law provides me a plethora of opportunities to explore. I could set up my own law firm and practice in a court of law arguing cases for my client. I could work in a law firm. I could join an IP solutions firm and offer my expertise to protect scientific ideas coupled with technology. I could be recruited in a company as a patent advisor, wherein I could join hands with their team of scientists and guide them by offering my legal opinion on the patentability of their manufactured products and manufacturing processes. I could join the government and extend my support in granting and denying patents to old and upcoming inventions.

Right before you, I have five tempting ways of making a decent living through an interesting and intellectually stimulating job. I am raring to take a plunge into this sea of opportunities to see what awaits me in my future. I hope that through this short space created for my thoughts, I was able to at least give you a brief insight into the various exciting opportunities lying ahead of you after completion of your Masters in biotechnology. Go figure!

*MADHUMITHA VASAN
LLB(HON) IIT, KHARAGPUR. ALUMNUS 2014-15*



A successful businesswoman, a renowned entrepreneur and an eminent role model is Kiran Mazumdar-Shaw., Chairperson and Managing Director of Biocon Ltd. She has been ranked as the 92nd most powerful woman in the world in 2014, by *Forbes* and also listed in the top 50 businesswoman in the world! Kiran Mazumdar, a native of Bangalore, completed her graduation in B.Sc. Zoology from Bangalore University in 1973, after which she earned the Master Brewer's degree in Australia and got trained at Biocon Biochemicals Ltd, Ireland. In 1978, at the age of 37, she founded Biocon India- a small industrial-enzymes company, in the garage of a rented house at Bangalore. Daunting challenges doubting her credibility, logistical issues and financial predicament initially made her goal unattainable. However she managed to transcend these barriers and transform Biocon into India's first biotech based company to manufacture and export enzymes overseas. Biocon has now evolved into India's largest fully-integrated, publicly traded, innovation-led biopharmaceutical company and distributes its products in 85 countries across the globe. It aims at delivering cut-price biopharmaceutical solutions for chronic disorders like autoimmune diseases, diabetes and cancer in India. It's a perfect combination of innovation and affordability!

Biocon's business venture mainly focuses on small molecules, novel molecules. biosimilars, branded formulations and research services; from their discovery to development and commercialization. A recombinant human insulin INSUGEN®, a low-priced insulin delivery device INSUPen®, indigenously produced 'First Class' biologic treatments Bi-oMAb-EGFR® (Nimotuzumab) for head and neck cancer, ALZUMAb™ for Psoriasis and CANMAb™ (Trastuzumab) for breast cancer are some of the key products introduced in India by Biocon. Since 1982, Biocon has bagged prestigious awards globally. Recently, Biocon has been honored with the 'WHO- India Public Health Champion Award' for its exceptional contribution in ameliorating living standards in India.

When asked about her journey towards excellence, Kiran Mazumdar says that *everyone has a sense of purpose and spirit of challenge* and her motive was to build a business based on biotech which no one had ever thought of. She wanted to show the world that women can run and manage a business and it is possible! Her main objective was to be successful. She had no background knowledge of business and was a complete novice when she started. But her passion prompted her to create her own learning so as to speak on the job. As she started building her business, she realized *it's a voyage of discovery*. There's always a rationale and strategy behind every step and slowly one learns to deal with problems on the job itself.. Mazumdar-Shaw's journey was full of struggles. She had to travel to many remote parts of the country, even the ones that are not considered very safe for women. But what kept her going was the support from her parents who had faith in her and motivated her to pursue her dreams. She believes that being a woman is a privilege and women can stand on their own and match one for one with men! Her advice to young aspiring entrepreneurs is to turn a deaf ear to criticism, to work on the strengths and take advantage of it.

DEBAIPSA BHATTACHARYA

MSCT PART II, 2015-16

A ROAD MAP FOR BIOTECH GRADUATES

SAS PROGRAMMING:

The conduct of statistical analyses of clinical trial data requires strong statistician-programmer collaboration. Statisticians formulate a plan to analyze and report data, and SAS programmers implement this plan, by developing computer programs to generate tables, listings, and graphs, which summarize the trial results.

PROJECT MANAGEMENT:

A clinical project manager is responsible for project administration and coordination of clinical trial activities, like reviewing proposals, budgets, contracts and tracking of project milestones and timelines.

MANSI GANDHI. BIOSTATISTICIAN, FIN ORION PHARMA INDIA PVT. LTD. VISITING FACULTY

The BT industry, like IT, was expected to “boom”, and create a fertile job market in India. In India, approximately 20,000 students graduate every year from over 650 institutions that offer undergraduate and/or post-graduate programs in BT. However, unlike the IT sector, which hires engineers and MBAs in thousands, the Indian pharmaceutical industry does not even hire graduates for research-based laboratory roles in hundreds, and probably not even in tens. Pharmaceutical giants, as well as mid-size companies, primarily from U.S.A. and Europe, have been outsourcing a major chunk of their clinical research activities to Indian contract/clinical research organizations (CRO) and business process outsourcing (BPO) companies, thus creating a stable job market for fresh life science graduates, as well as for experienced professionals. The nature of work of some of these roles are described:

CLINICAL OPERATIONS:

The role of a clinical research associate (CRA) involves monitoring the conduct of a clinical trial. A CRA ensures that a trial is conducted in compliance with the clinical study protocol and the regulations of authorities

DATA MANAGEMENT:

The primary responsibility of a data manager is to formulate and implement appropriate data capture procedures for clinical trials, and to enhance the quality and reliability of clinical data. The role of a data manager involves cross-functional collaboration with clinicians, statisticians, and also with investigators at sites

FROM THE WORLD OF BIOINFORMATICS

A bioinformatician can have different roles varying from research to corporate sector products for life science. The research in bioinformatics is virtually non-ending as a particular set of data can be analyzed in many different ways. A certain project would focus only on one goal and thus perform specific analysis on the data, leaving all other types of analysis and objectives untouched. For example:

A researcher working on a metagenomics project aims to study about contribution of nitrogen fixation activity by the bacterial flora of a region. Therefore, a scientist sequences a water sample from ocean without culturing and then builds tools to carry out analysis. There is another researcher who is studying the same region but the purpose of his study is different e.g., Hydrocarbon degradation. Thus, he acquires the dataset from the first researcher and constructs his own tools to extract relevant information. Similarly, that same dataset can be studied in many different ways for various objectives. Another important aspect of bioinformatics is simulations but simulations of what? The answer is ANYTHING.

The simulation can be of a biological process as a whole (like a metabolic process) and how it would work in different conditions (like environmental conditions, or after administration of drugs), this is called systems biology simulations. The other type of simulations are molecular simulations, wherein we can study interactions of molecules or with environment *in silico* before we try them in wet labs, in order to do research in an economical and faster rate. Simulations can also be carried out to predict structures of molecules which are not known to us due to reasons like stability or rarity or just plain lack of funds.

Drug discovery is another important domain of bioinformatics, where we can use a combination of simulations and cheminformatics tools to identify possible drug targets and drug molecules from a library of thousands of molecules. Most of these and other types of research in this field involve building and using of tools which are specific to the task at hand, which is done by corporate houses/start-ups. It is these bodies which provide the technical expertise and support, for building of highly specific and customized tools and software, as also lend any kind of support that may be required in using this software. They make available the infrastructure that will be required to process the huge amounts of data and also store it in forms of databases.

Most new sequencing technologies partner with IT industry to create software that will process the data coming from the machine and create a simplified report that can be understood by all. The IT part of the bioinformatics can also be used to foray into healthcare market, where the industry can partner with healthcare providers to provide solutions and support for routine tasks like bio-banking, grants management, patient and clinical management, etc. So in all bioinformatics is an important part of life science research and has a lot of scope for everyone who's building roots in Biotechnology.

MANAN SHAH

BIOINFORMATICIAN, PERSISTENT SYSTEMS LIMITED

HEALTHCARE & BIOTECHNOLOGY: A BOON FOR EMERGING CAREER

Biotechnology & pharmaceutical both compiled together is a boon for ethical healthcare industry, with its immense growth potential, they will continue to play a significant role as an innovative & significant healthcare sector in enhancing India's global profile as well as contributing to the growth of the economy. Research options for those like me, who are not very keen on research or R&D aspect of healthcare industry can try there luck in pharmaceutical marketing by getting into a reputed B-school for management studies. Since it is evident that pharmaceutical marketing has much more glam than research, it is also much more challenging.

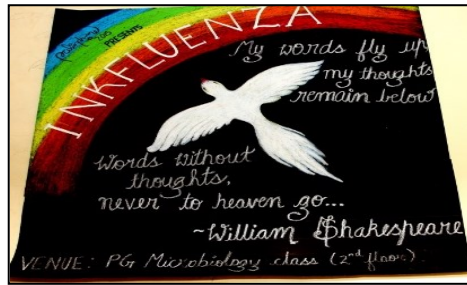
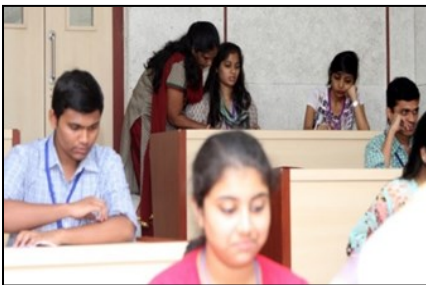
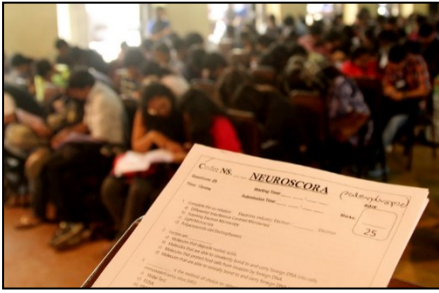
One has to understand the industry inside out to be an enviable part of it. Unlike FMCG marketing; pharmaceutical marketing has a lot to do with customer relation building where our direct customers are top notch doctors & indirect customers are the patients. For students who want to have their career way apart from the age old research & marketing can try to get into advertising agencies. There are agencies today which are specially working for healthcare sector which can serve the purpose of students aspiring for such career. The most important aspect to be considered today is, where exactly you have to land in the near future? Think wisely & choose what is best for you, which you think you can give your cent percent for.

For making a career in marketing the aspirant should be very passionate about the challenges that will come in their way, as no 2 days will be same. But this itself is cream on the cake that “no 2 days will be the same”. While some of you will not be very keen on entering into pharmaceutical industry, you can also try to get into biotechnological giants which are well established in India. Marketing for biotechnological company can be as great as for pharmaceutical company. A great advice for biotechnology students would be if it has to be research, try to get into a good biotechnology or pharmaceutical company which has its own R&D facility, or if it has to be marketing; go ahead with management studies & get placed in a reputed pharmaceutical company with good IMS ranking.

No career today is of less caliber, it's how you make it best use of yourself to brighten your career. It has become the part of accepted wisdom that 20th century was the era of physics while the 21st century is the improvisation of biology and its application for day to day human benefits. Healthcare & its counterparts like biotechnology & pharmaceuticals are now measured by the size of budgets & newer paradigm that taps the research opportunities for them. The most important aspect to be considered today is, where exactly you have to land in the near future? Think wisely & choose what is best for you, which you think you can give your cent percent for. No career today is of less caliber, its how you make it best use of yourself to brighten your career.

*NAMITA PARULEKAR,
PRODUCT EXECUTIVE (DERMATOLOGY), AJANTA PHARMA LTD.*

DOWN THE MEMORY LANE!



DOWN THE MEMORY LANE!



THE NOBEL LEGENDS!



**Remembering those legends of the past decade
and their legendary tales whose contribution to
Biotechnology has broadened our knowledge of
the subject.**

SCIENTIFIC RECOGNITION IN THE SHAPE OF A ‘NOBEL PRIZE’

The Nobel Prize in Physiology or Medicine was founded by Alfred Nobel in his will and is administered by the Nobel Assembly at Karolinska Institutet, Stockholm, Sweden. It is awarded to prominent investigators in the field of life sciences and medicine for their breakthrough discoveries beneficial to mankind and thereby captivating the scientific community with their exceptional brilliance! The medal customized by Erik Lindberg for the Nobel Prize in Physiology or Medicine portrays “*a Genius of Medicine holding an open book in her lap, collecting water pouring out from a rock to quench a sick girl’s thirst*”. It beautifully depicts the very purpose for awarding the Prize. In 1901, Emil Adolf von Behring became the first Nobel laureate in Medicine for his noteworthy work on serum therapy. Since 1901 to 2014, the legacy has been maintained by 207 Nobel laureates in Medicine, out of the overall 889 Nobel laureates globally. Here is an overview of some of the phenomenal discoveries illustrating the prodigious ability of human intellect witnessed in the decade of 2005- 2015.

AUTHOR: OINDRILA DE

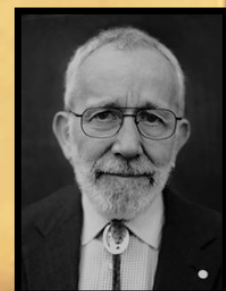
CONTRIBUTORS: RUPALI SHINDE, NEEDA NASIR, PRIYA YADAV

The Unforeseen Discovery of a Bacterium!

Recipients: Barry J. Marshall and J. Robin Warren

They were accredited for the discovery of *Helicobacter pylori* as the causative agent of most gastric and duodenal ulcers, contradicting years of medical belief that ulcers were caused due to stress, spicy food and excessive acid. In 1982, Robin Warren, an Australian pathologist first observed an unexplored bacterium in biopsies of patients suffering from gastric ulcers. Barry Marshall, intrigued by Warren’s findings, successfully cultivated the bacteria from several biopsies. Together with years of meticulous research, they deciphered the correlation between the bacterium (later named as *Helicobacter pylori*) and the inflammatory gastric disease. Their discovery was invaluable in replacing the then existing dogma that peptic ulcers led to a chronic, disabling condition and was a prerequisite in establishing antibiotic regimens for curing the disease.

2005



Unraveling the Mystery of Gene Regulation by Discovering RNA Interference!



Recipients: Andrew Z. Fire and Craig C. Mello

They were honored for their discoveries that small snippets of double stranded RNA when introduced into a cell destroy mRNA with identical genetic code with the ultimate effect that the mRNA cannot be translated into protein; a process termed as 'gene silencing'. Fire and Mellow explicated the regulatory mechanisms of gene expression in *Caenorhabditis elegans* by injecting double-stranded mRNAs encoding for specific proteins and analyzing the consequent silencing of the gene. They also succeeded in elucidating the exclusive machinery for degrading existing mRNAs and thereby inactivating the gene. Their unequivocal work was published in *Nature* in 1998, delineating the natural existence of such a remarkable regulatory mechanism in plants and animals. It was further deduced that RNA interference also aids in defending viral infections and controlling transposon activity. The enthralling work of these American scientists complemented with series of experiments to inactivate worm proteins with RNAi (RNA interference) were harbingers of understanding gene function and developing novel therapeutics. These findings were thus made amenable for exploitation in biomedical research and gene technology.

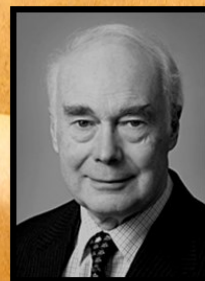
2006

2007

An Amalgamation of Two Ingenious Ideas Instituting Gene Targeting

Recipients: Mario R. Capecchi, Oliver Smithies and Martin J. Evans

They were acknowledged for their conspicuous creation of knockout mice models and for devising 'gene targeting' which has wide applications in understanding animal physiology, role of specific genes during both developmental stages and in adult mammals, developing animal models for better understanding of human genetic disorders and thereby assessing the efficacy of gene therapies. Mario Capecchi and Oliver Smithies dedicatedly directed their concerted work towards modifying genes in mammalian cells by utilizing the innate mechanism of homologous recombination, for repairing defective genes and eventually deciphered that all genes are vulnerable to modification by homologous recombination. However they were unable to create animal models for which cells giving rise to germ cells was a necessity. This hurdle was overcome by Martin Evans whose independent work involved employing mouse embryonic stem cells and modifying them with the help of retroviral vectors. Blending these two impeccable ideas led to the generation of exemplary gene targeted mouse strains. Knockout mouse models have indeed served the purpose of a paragon in the field of biomedical sciences!



2008

The Quest for the Culprits of Two Devastating

Recipients: Harold zur Hausen, Françoise Barré-Sinoussi and Luc Montagnier

The Nobel Prize was shared by Dr. Harald zur Hausen *for his discovery of human papilloma viruses causing cervical cancer* and the other half jointly by Françoise Barré-Sinoussi and Luc Montagnier *for their discovery of human immunodeficiency virus.*

In 1970s, Dr. Zur Hausen of the German Cancer Research Center went against the then persisting doctrine by theorizing that oncogenic human papilloma virus (HPV) is the cause of cervical cancer. For over a decade, he continued his meticulous inspection of the historical aspects of HPV and his search for oncogenic HPV types in cervical cancer biopsies. In 1983, he successfully discovered HPV type 16 and 18 which caused cervical cancer in approximately 70% of the patients globally. His discovery paved the path for understanding HPV mediated carcinogenesis and developing vaccines against it. In 1981, on the expedition for identifying the causative agent for AIDS, Françoise Sinoussi and Luc Montagnier scrutinized the enlarged lymph nodes in patients suffering from acquired immunodeficiency. They detected viral particles and enzyme- reverse transcriptase in infected cells and were able to partly explain retroviral replication and impairment of immune function. They further characterized the retrovirus (now known as HIV) as lentivirus. This discovery made rapid cloning of HIV-1 genome possible and led to development of diagnostic methods and anti-retroviral therapies.



2009

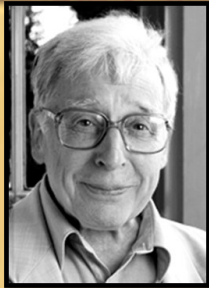
The Mystery of the Endangered End of Chromosomes Resolved!

Recipients: Elizabeth H. Blackburn, Carol W. Greider and Jack W. Szostak

Replication of the ends of chromosomes and their protection against degradation always remained an unsolved puzzle! The victorious laureates of 2009 solved this baffling mystery! Elizabeth H. Blackburn, Carol W. Greider and Jack W. Szostak were jointly honored with the Nobel Prize for the discovery of *"how chromosomes are protected by telomeres and the enzyme telomerase."* An Australian-American biological researcher Elizabeth Blackburn, experienced in mapping DNA sequences, while studying the chromosomes in *Tetrahynema* identified a repetitive sequence (telomere) in the extremities. Intrigued by her work presented at Nucleic acids Gordon Conference in 1980s, was Jack Szostak who was working on mini-chromosomes susceptible to degradation in yeast cells, at the Dana- Farber Cancer Institute. Blackburn and Szostak collaborated to analyze the activity of mini-chromosomes coupled to the repetitive sequence. To their surprise, these mini-chromosomes were protected from degradation. Carol Greider who was then a graduate student under the supervision of Blackburn, investigated the enzymatic activity involved in protecting the ends of chromosomes. By 1984, they discovered the enzyme 'telomerase'. It was further elucidated that telomerase activity pervades all kingdoms and is elemental in delaying senescence. The discovery of telomerase also added a new dimension to understanding cancer biology and provoked the emergence of novel therapeutics!



Birth of Louise Brown- An Epoch Accomplishing Human *In Vitro* Fertilization!



Recipient: Robert G. Edwards

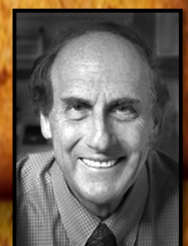
British scientist Robert Edwards, with the vision to advance science and technology, has fulfilled the dreams of millions of childless families. In 1950s, Edwards began his journey of skillfully engineering human *in vitro* fertilization (IVF) to treat infertility; which seemed elusive then. Successful results of rabbit IVF demonstrated by other investigators facilitated Edwards' ideology. His initial attempts of IVF achieved fertilization in a regulated environment but failed to develop beyond the single-cell division stage. This was overcome by implementing the usage of mature eggs obtained by laparoscopy. An experimental saga involving a large number of co-workers transformed Edwards' imagination from an experimental finding to a realistic revolutionary therapy! In this process Edwards also contributed significant insights to developmental biology. On 25th July 1978, world's first IVF baby, Louise Brown was born as a result of Edwards' successful new treatment. IVF is indeed a groundbreaking discovery; it has been established as a successful therapy globally and has been improvised over the years.

2010

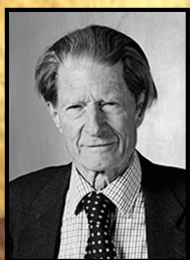
The Orchestrated Activation of the Immune Response Remains No More an Enigma!

Recipients: Bruce Beutler, Jules Hoffmann and Ralph Steinman

We are the most privileged in terms of intellect and behavioral modernity; however we are as vulnerable as an endangered species when it comes to suffering an assault by an infectious attack! To combat such an onslaught, we have been provisioned with a systematized defense mechanism marshaled by immune cells. The intricate details of this intrinsic system have however remained mysterious. Bruce Beutler, Jules Hoffmann and Ralph Steinman were rewarded for their monumental efforts in expounding the underlying mechanisms of activation of our immune system and the cooperative action of our innate and adaptive immunity. In 1973, Ralph Steinman discovered the 'dendritic cells' necessary for the activation of T-cells which govern adaptive immunity. In 1996, Jules Hoffmann and his colleagues identified 'Toll' genes essential for the recognition of a pathogen and subsequent elicitation of an immune response in fruit flies, through mutational studies. In 1998, Bruce Beutler and his co-workers identified the 'Toll-like' receptors involved in binding to bacterial cell wall components followed by activation of the immune system. These findings provided striking insights to the activation of innate and adaptive immunity



2011



2012 CONQUERING THE UNIMAGINABLE!

Recipients: Sir John B. Gurdon and Shinya Yamanaka



Is the voyage of a pluripotent stem cell to its specialized state unidirectional? Is the firm conviction of the scientific community on the irreversibility of this transition true? Or is there any ambiguity? These were probably the questions in the masterminds of Sir John B. Gurdon and Shinya Yamanaka which laid the inception of their revolutionary discoveries! In 1962, Sir John Bertrand Gurdon, dexterous in nuclear transplantation and cloning at the University of Oxford, propounded his ideology that the specialized cell has inherent ability to develop into any cell type of the organism. He tested his hypothesis in his classical experiment, wherein a frog's intestinal epithelial cell nucleus was inserted into an enucleated egg cell which further developed into a normal tadpole. These results manifested that the intact genomic attributes in a mature cell aid in accomplishing reversion. Initially, the scientific community conveyed reluctant acceptance. Many investigators then followed suite and confirmed the experimental findings. 40 years later, Shinya Yamanaka at Kyoto University ventured into this arena with the objective to revert an intact mature cell by studying the genes involved in maintaining the pluripotent state in an embryonic stem cell. Yamanaka's naïve ideology was facilitated by the accumulated empirical data of immense work in the past decades by various investigators. In 2004, he and his team members discovered 4 genes essential for establishing pluripotency after screening an innumerable combination of 24 candidate genes; indeed a Herculean task! By 2006 they successfully generated human embryonic stem cell-like cells by inducing mouse fibroblasts with these four factors. The seemingly implausible reversion of specialized cells into a pluripotent state pioneered by Gurdon's diligent research for decades and Yamanaka's anomalously short yet resolute expedition fetched these two visionaries the prestigious Nobel Prize in Medicine in 2012. Their work was elemental in leading to a quantum leap in the field of developmental biology!

2013 DISCLOSURE OF AN INTRINSIC DILIGENT 'POSTAL SERVICE'

Recipients: Dr. James E. Rothman, Dr. Randy W. Schekman and Dr. Thomas C. Südhof

Every cellular function is reliant on signals or mediators which need to be released at specific locations, fuse with membranes, travel across organelles and ultimately reach their target; in response to a stimulus bang on time! Cellular consignments need to be efficiently and punctually delivered to their specific destinations; failure of which could be detrimental to physiological well-being. This entails a mechanistic transport system; the molecular details of which had however remained vague. Dr. James E. Rothman, Dr. Randy W. Schekman and Dr. Thomas C. Südhof were jointly honored for discovering the regulated vesicular trafficking- an indispensable well organized system cardinal in the normal functioning of a cell as well as a biological system as a whole. In 1970s, Randy Schekman studied the genetic details of the transport system using yeast as a model. 1980-1990s, James Rothman studied protein complexes involved in membrane fusion during vesicular transport in mammalian cells; which were further correlated to Schekman's findings. In 1990s, Thomas Südhof explored the transport system in nerve cells and emphasized the importance of calcium influx for vesicular trafficking in his findings; thereby explaining how vesicular contents are released only on command.



2014

The Navigation System in Our Brain!

Recipients: John O'Keefe, May-Britt Moser and Edvard I. Moser

The built-in positioning system in our brain coordinates and chaperones each and every movement thereby orienting us in space. Our perception of distance, place, and position is dependent on this exquisite positioning system. John O'Keefe determined that certain nerve cells ('place cells') in the hippocampus region of the brain generate cognitive maps which are initiated by specific position in the environment in rat models. May-Britt Moser and Edvard Moser recognized 'grid cells' in the entorhinal cortex region of the brain essential for spatial orientation. Together these cells develop a circuit which establishes navigation. Also called as the 'inner-GPS' thus administers thinking, planning and memory. Investigational evidences provided by experimental studies on patients undergoing neurosurgery with brain imaging techniques; confirmed these findings. These noteworthy findings aided in enhancing our approach towards understanding cognitive processes and neurological disorders related to memory-loss.

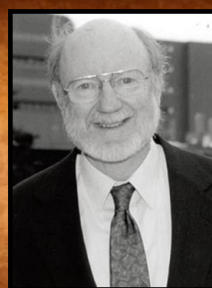


2015

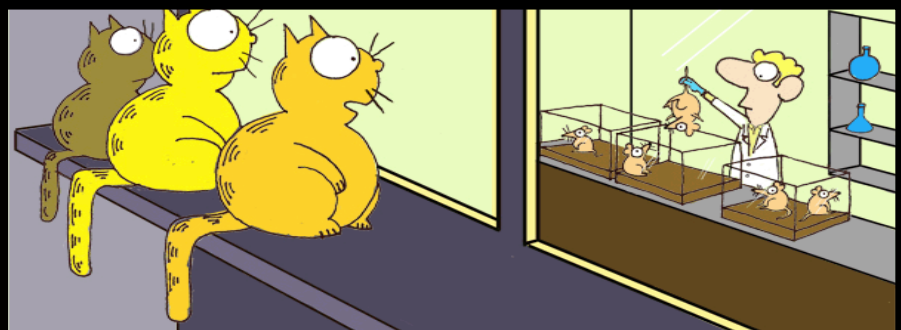
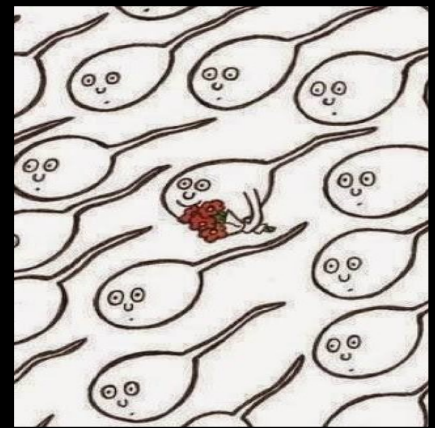
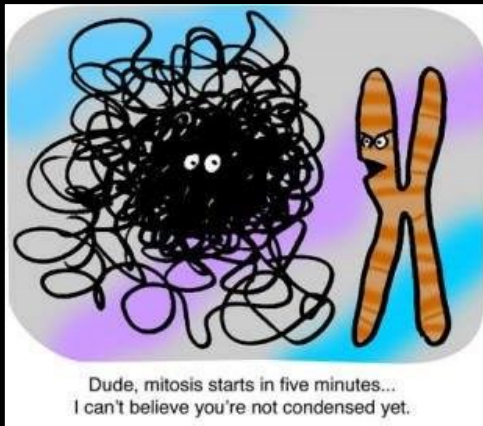
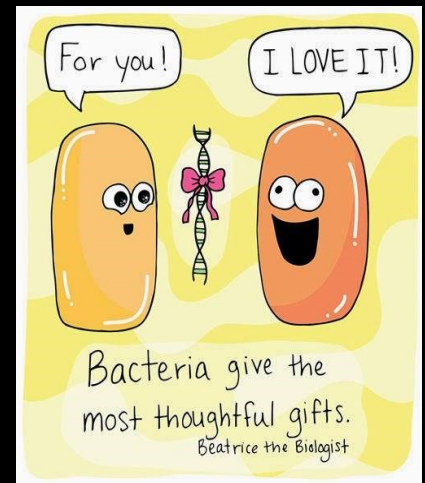
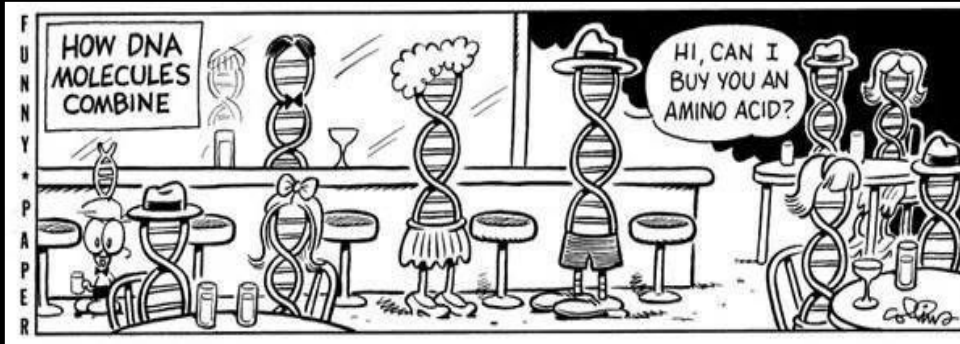
Novel Drugs to Combat Demonic Parasites!

Recipients: William C. Campbell, Satoshi Ōmura and Youyou Tu.

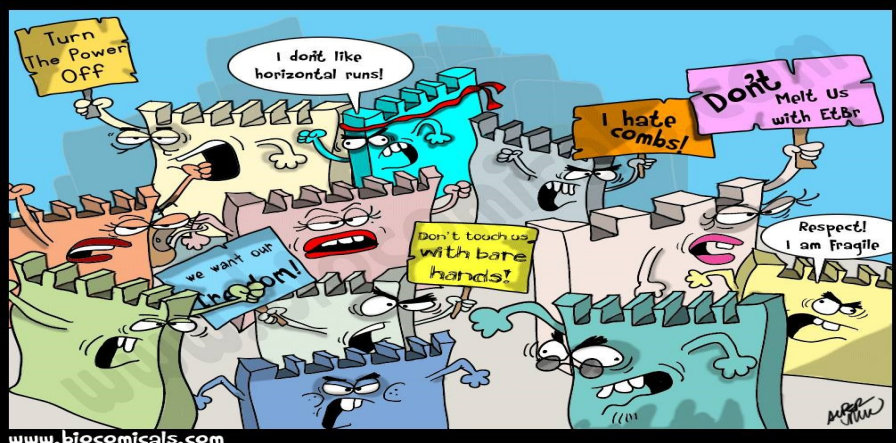
This year the Nobel Prize in Physiology or Medicine was jointly awarded to William C. Campbell and Satoshi Ōmura *for their discoveries concerning a novel therapy against infections caused by round-worm parasites* and Youyou Tu was awarded the other half *for her discoveries concerning a novel therapy against Malaria*. "Parasitic diseases have devitalized human health for a millennia and every year account for a huge number of deaths globally. Therapeutic developments have been stagnated for decades. This year's laureates have attempted to demolish the bedeviling parasitic barrier of mankind! Japanese microbiologist, Satoshi Ōmura isolated 50 strains of *Streptomyces* producing potential anti-bacterial agents after screening a plethora of strains. William C. Campbell, skilled in parasite biology at USA, explored these cultures and successfully discovered a bioactive component with the ability to terminate parasitic diseases like River Blindness and Lymphatic Filariasis in animal models. This agent, named as 'Avermectin' was chemically modified which enhanced its efficacy in clinical trials and was further re-named as 'Ivermectin'. The success rate of conventional chloroquines for treating Malaria has been diminishing over the decades. Youyou Tu in China investigated the traditional herbal remedies along with existing literature and identified a promising anti-malarial agent from *Artemisia annua* plant. Named as 'Artemisinin', its anti-malarial property was successfully demonstrated in both infected animals and humans.



COMIC CORNER!



"Boy! I would love to be his pet cat."



TODAY'S TRENDS!



Highlighting a few trends in this elaborated field that has left the world buzzed today so as to inspire and instigate young minds to think out of the box

TEST TUBE BABIES

India has an age-old association with in-vitro fertilization. The story of Louise Brown, the world's first test tube baby is well acknowledged. However, few know that the world's second test tube baby – Durga, was born right here in India, merely a couple of months after Louise. Taking into consideration the paucity of research facilities and technological resources in India in the late 70's, this must be considered a feat that far surpasses the first.

Dr. SubhashMukhopadhyay is the man to be credited for this medical marvel. Even in the face of social ostracization, he – quite literally, brought his idea to life. The very thought of creating life in a laboratory was one that stirred up all sorts of controversies. These experiments were branded physicians' attempts to play God; and the ethics and morality of interfering with the process of natural selection were brought into question.

However, in retrospect, we can safely say that the introduction of IVF has been one of the medical advances that have greatly benefited thousands of families in this country. Having children is an aspiration that is shared globally. However, in India, this assumes a much larger importance both socially as well as economically. IVF as a means to achieve this goal has come to be widely accepted, not only by the upper strata of society – as it was once accustomed to be, but by people from all backgrounds. Increasing awareness, ease of dissemination of information, and diminishing distances are responsible for the ascent of IVF in the country. Today, India is at the forefront of the field of reproductive medicine. The baby-making industry currently rakes in 14.2 billion rupees annually. Key drivers of growth in this sector include the increasing prevalence of infertility among couples and the recognition of India as a favoured destination for fertility tourism.

Gujarat is one such destination that has earned its name as a “hotspot” for IVF treatments and surrogacy. The economic development of the region is owed to the income generated by the field of reproductive medicine. But while these treatments have come a long way in public opinion since the days of Dr. Mukhopadhyay, they continue to be marred by controversy.

One of the matters of concern today is the exploitation of surrogate mothers. There is no clarity on who can and cannot opt to be a surrogate; and the rights of sperm and egg donors are open to interpretation. Today anyone is allowed to open an infertility clinic and offer services for Assisted Reproductive Technology (ART) with no accountability to a central regulatory body. Nonetheless, the infertility business has experienced exponential growth in the last two decades, putting India on the world map for IVF treatments. The market is expected to register a Compound Annual Growth Rate (CAGR) of 14 percent over the next five years. But for this to be a feat of which we can be proud, a framework of regulations is the need of the hour.

*KEERTHANA SRINIVASAN
ALUMNUS 2014-15*

THE 'HOPE' VERSUS 'HYPE'

Are stem cells just another case of 'hype' over stem cells with no 'hope' in practicality? But do not really know why they are in the limelight and who else can explain this better than stem cells themselves? So we had a hypothetical conversation with these miraculous cells and here is what we know!

I: So what does "Stem cell" really mean? What makes you so popular among the scientists working in different fields to recognise you in their work?

SC: My name suggests my inherent property of "stemness". I possess the ability to renew myself extensively and at the same time produce specialized cells of the body. Thus, I maintain a reservoir of undifferentiated cells inside your body which is a microscopic world buzzing with lot of activities and produce differentiated cells to build and maintain this world when the body demands. The specialized cells are incapable of making copies of them, so my presence is of use to replace them if they die or get used up and renew myself else my exhaustion can cost you your life! This property has caused me to reside in particular niches in almost every organ of the body and continue to serve my host. You can find me in the fertilized egg, where embryologists call me "embryonic stem cell" from which the life begins! In tissues and organs I am known as "adult stem cell" and more specifically called from the tissue or organ of origin for example, hematopoietic stem cell in bone marrow, cardiac stem cell in heart, neuronal stem cell in nerves, etc. Embryonic stem cells (ESCs) are referred as pluripotent and can differentiate into any cell found in a fully grown animal whereas, adult stem cell are multipotent and produce billions of cells specific to the tissue. So the stem cell has to make a decision, every time it divides it produces two daughter cells and those daughter cells can be either be new stem cells or specialized cells.

I: What role do you play in therapy?

sc: The Food and Drug Administration (FDA) has approved numerous stem cell-based treatments for clinical trials. A 2013 report from the Pharmaceutical Research and Manufacturers of America lists 69 cell therapies as having clinical trials under review with the FDA, including 15 in phase 3 trials. The therapeutic categories represented in these trials include cardiovascular disease, skin diseases, cancer and related conditions, digestive disorders, transplantation, genetic disorders, musculoskeletal disorders, and eye conditions, among others. Still, the earliest stem cell therapies are likely years away. To date, the only stem cell-based treatment approved by the FDA for use in U.S. is for bone marrow transplantation. As of 2010, more than 17,000 blood cancer patients had successful stem cell transplants. In India, there are stem cell centers which aim to successfully cure ailments such as Alzheimer's, liver cirrhosis, Diabetes, Sports injuries, etc. So as you can see, a plethora of research work has been done and has been in the doing in the field in the world and in India. However, many ethical issues arise with this. Nonetheless, such a therapy waits to become the answer to all cell-based therapies in the near future.

I: Thank you so much for broadening our horizons of knowledge and sharing your experience with us. So with this we can say that the 'hope' versus 'hype' over stem cells is perhaps tilting towards a positive direction as the number of clinical trials has increased over the past years.

*SINI PORATHOOR AND RIA DARNE
MSC PART II, 2015-16*

YOUR SPARE PART IS JUST A CLICK AWAY: BIOPRINTING

In the year 1976, the inkjet printer made its first appearance, due to the efforts put in by Charles Hull, the co-founder of 3D systems. Charles Hull invented the stereo lithographic printer that enables a tangible 3D object to be created from digital data. It had huge applications in jewellery making, automobile industries and aviation industries. A modification in the ink jet printer was to replace the ink with materials like tissues, human cells, molecules, extracellular matrix and thus 3D objects could be obtained which found immense applications in the medical field by 1999. This process was called 'Bioprinting'. A working kidney was made followed by a prosthetic leg in 2008, which had the knee and socket joints. Then a company called Organovo printed blood vessels after which prosthetic jaw was made and was implanted into an 83 year old woman with chronic bone infection. Researchers have jointly created an artificial ear using this wonderful technique, it does not end here, Researchers in China's Hangzhou Dianzi University claim to have developed a biomaterial 3D printer they call 'Regenovo' that they say can print out small amounts of human tissues.

The 3D bioprinted organs can be used for transplantation without the risk of rejection; they can also be used to personalize medicines by testing the medicines on the 3D bioprinted tissue of the patient and then accordingly dosing the patient to obtain optimal results. 3Dbioprinted organs and tissue can also be used in pre-clinical trials. The use of animal models can be kept on a hold, as drug toxicity testing cannot be determined correctly using animal models.

A cartridge filled with pure human live cells called bioink is used here. This cartridge can move in 3 planes to create a live organ or tissue piece. The cells are placed on a support system like a gel and the structure are built on the surface layer over layer and one cell at a time. The cells that were used could be obtained from any source, a major source being embryonic cells. Thus, the use of raw materials like molecules, extracellular matrices, and living tissues were used to construct an entirely live organ or tissue that can be used to give life. The leading companies in bioprinting include 3D Systems Inc., Envision TEC, Organovo Holdings Inc., Stratasys Inc., 3D Biotech, Advanced Biomatrix, Bespoke Innovations, DigilabNano3D Biosciences, regenHU.

There will be a day when surgeries will take place by robotic hands that will insert a cartridge filled with the patients' cells into the bioprinter and the print command will generate a 3D organ to be inserted into the patient.

*RACHEL AGERA
MSC PART II, 2015-16*

THE CAMEL FLU

It all started during the summer in 2012, in Saudi Arabia when an Egyptian virologist Dr. Ali Mohamed Zaki isolated an unknown virus from the sputum of a patient who was suffering from renal failure and acute pneumonia. The novel isolate was yet to be established as a species from the large family of *Coronavirinae* whose family members were known to infect humans and animals. Coronavirus in humans specifically caused illness ranging from common cold to Severe Acute Respiratory Syndrome (SARS-CoV). In April 2012, at Jordan a number of patients suffering from pneumonia were infected with same virus. The onset of the new disease was then understood when later in September 2012, in Gulf region of the Middle East, the same type of virus was isolated from a patient suffering from severe respiratory illness. Additional cases were reported with death associated with patients suffering from SARS-CoV and monitoring and rapid research of this novel coronavirus began.

Three other patients, who acquired the virus outside the Middle East, became infected after their visit to Pakistan and Saudi Arabia. Since the discovery of this novel virus it is known by many different names specifying the regions it infected ex. Human betacoronavirus 2C Jordan-N3. But now the Coronavirus Study Group of the International Committee on Taxonomy of Viruses has renamed the virus after proper considerations and consultations as the Middle East respiratory syndrome coronavirus (MERS-CoV). According to March 27, 2014 summary update of MERS-CoV, suggests that the bats were the ultimate reservoir of these viruses, which then spread to camels by the mid 1990's and they became the primary reservoirs infecting humans from the early 2010s. The original bat host species and the time of initial infection in this species are not determined.

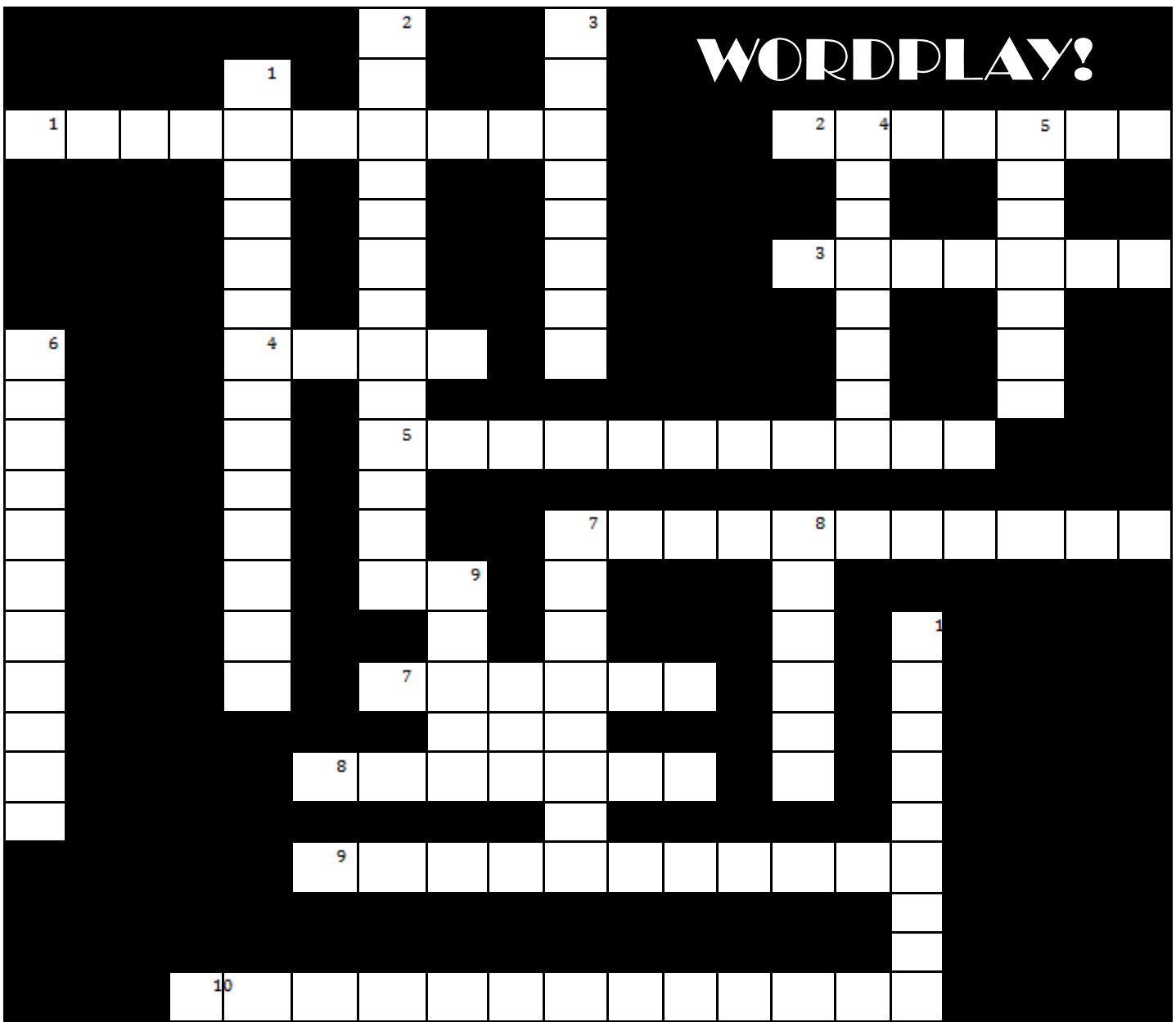
As per WHO, MERS has infected over 1,300 people and killed around 500 since it was first identified in 2012 and yet no vaccine is available for it. When experimentally tested in mice a protein which is an antibody, known as LCA60, grasps the MERS virus and prevents it from infecting the cell and also effectively reduces the level of virus in the lungs in few days. But this is not yet clinically proved and the research continues with the fact that no treatment currently exists for the ongoing outbreak of MERS in South Korea and China which has caused 186 infections and 36 deaths as per statistics of July 27 '15.

DENCY ALMEIDA

MSC PART II, 2015-16



WORDPLAY!



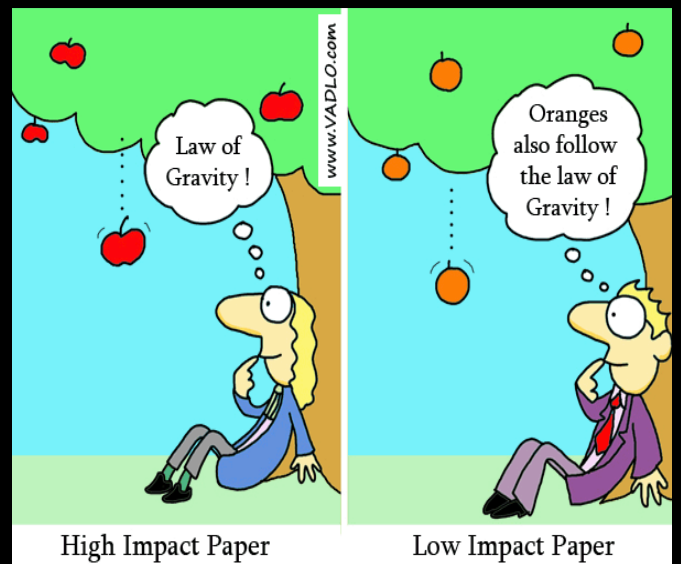
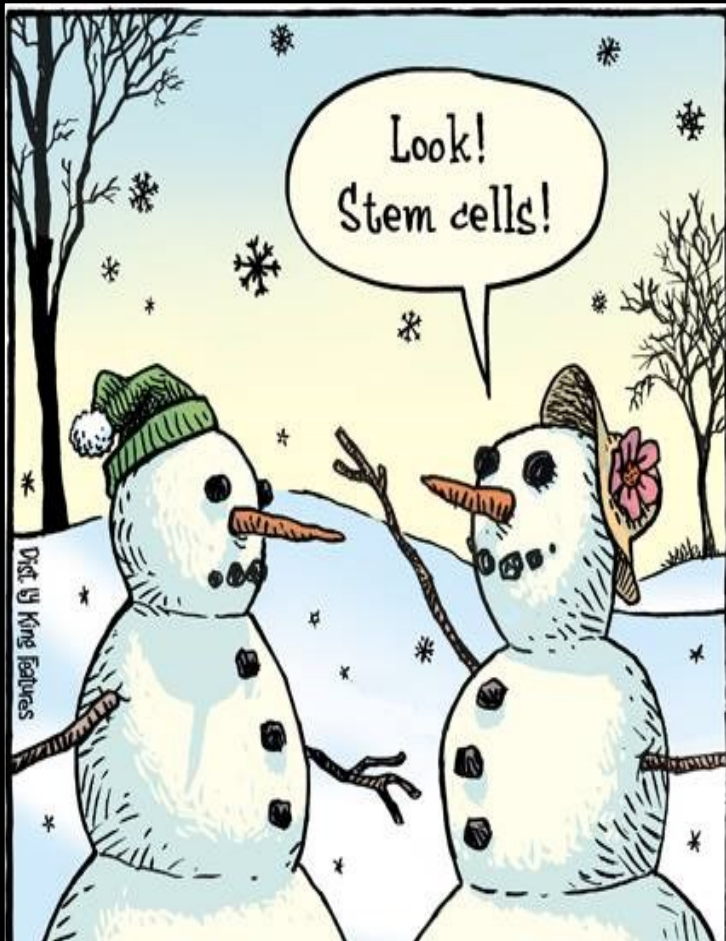
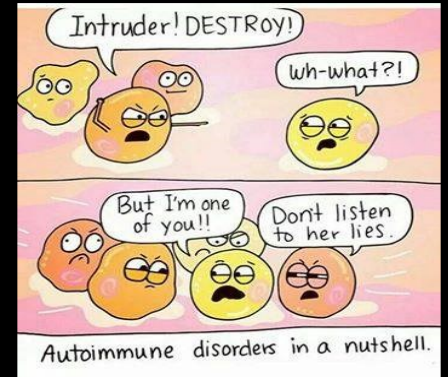
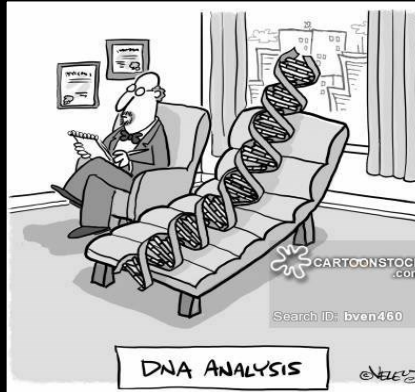
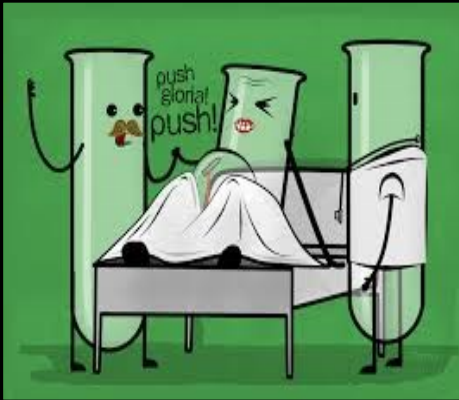
ACROSS

1. The subunits of proteins; each contains a central carbon atom attached to an amino group a carboxyl group and a distinctive "R" group
2. A large molecule made up of many repeating subunits
3. A disaccharide composed of glucose and galactose.
4. The smallest unit of life that makes up all living organisms
5. Long strands of DNA intertwined with protein molecules
6. The specialized organelle in plants responsible for photosynthesis
7. The chemical side-group on an amino acid; in nature, there are 20 different ones that are found on amino acids
8. A molecule that acts to regulate cellular functions
9. The 5-carbon sugar found in DNA molecules
10. A group of lipids that includes animal fats and plant oils

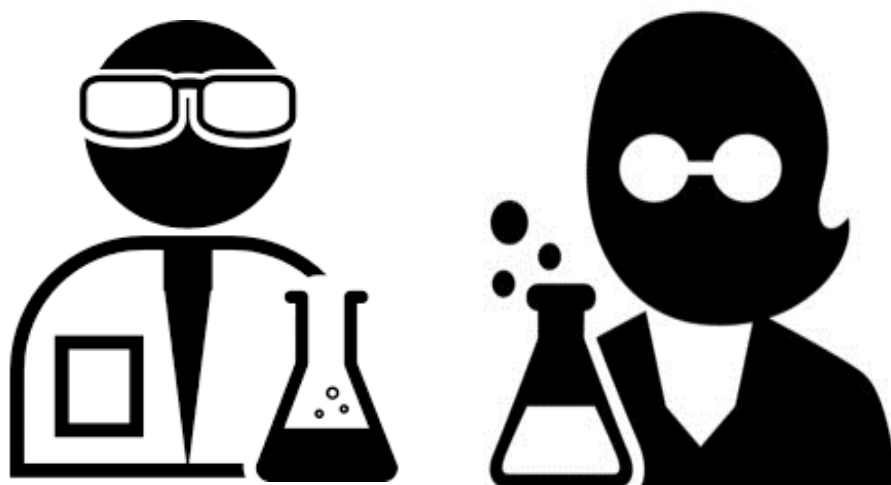
DOWN

1. The monomer unit that cells use to build polysaccharides; also known as a "single sugar" or "simple sugar"
2. Large molecule
3. A membrane-bound organelle that is responsible for the breakdown of cellular waste
4. A living thing
5. The repeating units that make up polymers
6. Having an attraction for water
7. Cell biology
8. The 5-carbon sugar found in RNA molecules
9. A simple carbohydrate molecule composed of hydrogen, carbon, and oxygen
10. Human epithelial cells

COMIC CORNER!



YOUNG SCIENTISTS!



Experimenting with not only chemicals of the laboratory but also with thoughts and techniques have led to research projects by our alumni. Since the whole purpose of our department is to train us to perform well in the real world, here are some glimpses of the same.

THE PARADIGM AFFAIR

Towards Perennial Manufacture of Universal Blood

*CONTRIBUTORS: RACHEL AGERA, OINDRILA DE, SWATI SHRI PAL SINGH
AND SMRITI VASWANI*

MENTOR: DR. BISWA PRASUN CHATTERJI

The global issue of blood scarcity and related complications during blood transfusion directed our intellect towards exploring the possible existence or manufacture of a perpetual blood reservoir which could be accepted universally. Blood donation drives are the sole source for blood collection. The insufficiency in blood supply is augmented by the lack of donors. Donated blood itself involves an inevitable threat of viral contamination and disease transmission. Cross-reactivity further jeopardizes this risky affair! An inexhaustible source of universal RBCs is indeed the only savior! Is there any way through which we can obtain an immortal source of flawless blood and exterminate the complexities involved with transfusion? Could compatibility issues be abolished? Our quest to find the answers divulged in the scientific brilliance prospectively accomplishing the task of relieving the burden of blood deprivation. We incorporated the current reports on potential strategies being employed to create synthetic blood and under scrutiny in our poster. Three main strategies were discussed in the poster presentation at the fest. The first strategy was to master the art of disguise! This was achieved by PEGylation mediated camouflaging of the RBC surface antigens to create 'stealth RBCs' which escape the immune surveillance. The second strategy was to rule out the unwanted! Pioneering work of Jack Goldstein and his colleagues demonstrated the elimination of RBC surface immunodominant markers by using specific enzymes such as glycosidases thereby converting the A/ B/ AB blood types into O blood type (ECO cells- enzymatically converted group O cells). Such enzymes were isolated from coffee beans, bacteria and fungi. The third and most efficient step was to engineer de novo synthesis! This was executed by the use of human embryonic stem cells (hESCs) to generate a repertoire of O negative type RBCs. Robert Lanza and his colleagues cultured hESCs under the influence of growth factors like VEGF, BMP-4, FGF for a period of 5 days, this was followed by culturing the cells with SCF and erythropoietin for 10 days. The hESCs differentiated into hemangioblasts and gradually into RBC's. Similarly Luc Douay and his colleagues described a method to utilize hematopoietic stems cells (HSCs) for *ex vivo* expansion into mature RBCs. These naïve yet promising inventions can revolutionize the blood delivery system!

DEPARTMENT PROJECTS!

Our department encourages scientific temper and quest for research in the minds of soon to become masters of biotechnology by giving an opportunity to conduct research within the lab facilities

WINTER TRAINING PROJECTS!

ACTREC

2012-14

SHREYA BHARGAVA (PI : DR. PRASANNA V.)

“IDENTIFYING NOVEL INTERACTING PARTNERS OF PSMD9, A PROTEASOMAL CHAPERONE, AND ASCERTAINING THE HOT-SPOT RESIDUES INVOLVED IN THE INTERACTION”

PSMD9, a non-ATPase subunit of the 19S regulatory particle of 26S proteasome, has earlier been implicated in its role as a chaperone mediating assembly of the holoproteasome. The existence of a PDZ domain within PSMD9 which interacts with the hydrophobic C-termini of many proteins compels one to investigate into the putative interacting partners of PSMD9. The independent binding of PSMD9 with the C-termini short linear sequence motifs of Growth hormone (GH) (with SCGF in its C-termini) and IL-6 receptor (with SCGL within the FN3 domain of its C-termini), studied using ELISA, helped confirm the hypothesis that the PDZ domain of PSMD9 interacts with the C-termini of the supposed binding partners. These interaction studies indicate the reasonable involvement of PSMD9 in degrading mutant forms of the proteins. Insight into the structural, spatio-temporal and functional status of PSMD9 can reveal meaningful links in the strategies employed by the cell to maintain protein homeostasis.

2012-14

SHEENA VARGHESE (PI :
DR. PRASANNA V.)

“DETERMINATION OF THE HOT-SPOT RESIDUE AT THE INTERFACE OF GANKYRIN AND CHLORIDE INTRACELLULAR CHANNEL PROTEIN 1 (CLIC1)”

Gankyrin is a subunit of the regulatory particle of 26S proteasome. A bioinformatics based study revealed Chloride Intracellular Channel Protein 1 (CLIC1), a membrane transport protein, as one of its interacting partners and subsequent research revealed the Gankyrin-CLIC1 interaction to be important in cell migration and invasion. Drugs that target the individual interacting partners of the regulatory particle need to be found to assist the treatment of cancer. Drug development requires a practical understanding of the interaction motifs and the hot-spots. In the Gankyrin-CLIC1 interaction it has been found that the motif EEVD on CLIC1 is important for the interaction.

2013-15

MADHUMITA VASAN (PI : DR. TANUJA TENI)

“ROLE OF USP9X IN STABILIZATION OF ANTI-APOPTOTIC PROTEIN MCL-1 IN HUMAN ORAL CANCER CELLS”

Myeloid Cell Leukemia-1 (Mcl-1) is an anti-apoptotic member of the Bcl-2 family known to be over expressed in diverse human cancers including oral cancers. The study on the process of Mcl-1 stabilization revealed the role of Ubiquitin Specific Peptidase 9 X-linked (USP9X) in deubiquitination of Mcl-1 which otherwise has a relatively short half-life and is rapidly degraded by proteasome. The breach in the normal pathway confers the malignant cell with resistance to chemo and radio therapies which can be reversed by small molecule inhibitor of USP9X.

2013-15

**NINOSHKA RODRIGUES (PI :
DR. B.V. VENUGOPALA REDDY)**

“CHARACTERIZATION OF RECOMBINANCE BETWEEN *REPOGAL4* AND UAS-MYC MERLIN DBB/ UAS MERLIN-RNAI TRANSGENIC LINES IN *DROSOPHILA MELANOGASTER*”

Hippo signalling pathway, a novel tumor suppressor pathway, includes two major players namely Hippo (Hpo) and Warts (wts). The end player of the cascade, transcriptional activator Yorkie (Yki), is found to induce apoptosis. Merlin, a member of the ERM protein family located upstream of the Hippo pathway, positively regulates the pathway. The present study focused on characterization of recombinant transgenic lines of *Drosophila melanogaster* involving *repoGal4*, Merlin RNAi and Merlin DBB for enhancer suppressor screen of their phenotypes which was generated to gain more insights into the mechanisms underlying growth inhibitory functions of Merlin.

2013-15

**ROSELINE D'SOUZA (PI :
DR. SORAB DALAL)**

“ROLE OF 14-3-3 Σ IN REGULATING EPITHELIAL MESENCHYMAL TRANSITION”

Epithelial Mesenchymal Transition (EMT) is a phenomenon observed during embryogenesis, whereby, epithelial cells are converted to mesenchymal cells which secrete matrix-degrading enzymes. Phenotypic changes manifested with EMT have been observed during tumorigenesis. Several EMT regulators i.e Snail, Slug, Zeb and Twist are responsible for the phenotypic changes that have been observed during metastasis in multiple solid tumours. It has been noted that loss of 14-3-3 σ causes an upregulation in slug expression. Slug expression is regulated by transcription factor c-jun and it was observed that 14-3-3 σ binds to c-jun and this interaction might predispose c-jun to degradation via ubiquitin proteasome pathway. The work focused on identifying if down regulation of Slug and c-jun in 14-3-3 σ -/- cells causes the cells to revert to epithelial phenotype.

KEERTHANA SRINIVASAN (PI : DR. SORAB DALAL)

2013-15

“ATPASE MUTANT OF 14-3-3 Γ SHOWS ALTERED CELLULAR LOCALISATION”

Cell cycle is one of the crucial processes of cell and hence needs the maximum regulation. 14-3-3 γ , a member of 14-3-3 protein family is known for its role in the regulation of cell cycle progression and is recently found to have intrinsic ATPase activity. The study carried out to examine whether gain of ATPase activity by mutation which lead to a two-fold increase in its ATP hydrolysing activity could have phenotypic effects on the expression or functioning of 14-3-3 γ revealed that the otherwise wild type protein found in cytoplasm and nucleus was localized in cytoplasm. This could be the cause of an unhealthy and necrotic appearance of cells as visualized by fluorescence microscopy. This study thus opens up several avenues for further exploration of the effect of this mutation on the ligand binding, oligomerization and functioning of 14-3-3 γ .

ACTREC

2013-15

DURMI SHAH (PI : DR. DIBYENDU BHATTACHARYYA)

“SIZE CONTROL MECHANISMS OF NUCLEOLUS”

Nucleolus, the structural and functional unit of interphase nucleus, shows prominent irregularity in size and volume in cancer cells. Work was directed towards analyzing the difference in nucleolus volume and number in immortalized and transformed cell lines of same tissue origin. The findings led to the role of dominant negative importin β involved in nuclear import blockade. Its' over expression increased N/C ratio and is considered as one among various unknown cytoplasmic factors involved in controlling size of the nucleolus.

LOUELLA FEGRADOE (PI : DR. SHILPEE DUTT)

“ROLE OF ARIH2 KNOCKDOWN IN GLIOBLASTOMA RADIATION RESISTANCE”

ARIH2 E3 ubiquitin ligase has been reported to be over-expressed at high levels in the radiation resistant cells in Glioblastoma (GBM), but its exact role in this context remains elusive. Here, the study aimed to determine whether knockdown of ARIH2 by lentivirus-mediated shRNA could inhibit occurrence of relapse cells in GBM or not. For this purpose, clones of pLKO.1 puro vector with ARIH2 shRNA insert were generated and transfected into mammalian HEK-293FT and SF-268 cell lines and checked for ARIH2 gene knock-down. Further experimentation in glioblastoma cells needs to be done to determine the role of ARIH2 gene knockdown in glioblastoma.

ANJALI PILLAI (PI : DR. S. V. CHIPLUNKAR)

“TCR GAMMA AND DELTA GENE REARRANGEMENT STATUS AS A POTENTIAL PROGNOSTIC BIOMARKER IN T - ALL PATIENTS”

T cell acute lymphoblastic leukaemia (T-ALL) is a neoplasm of the thymocytes. The study deals with analysing the clonality of T-ALL patients and establishing TCR gene rearrangements as prognostic markers using PCR. The confirmed role of TCR gene rearrangements as a prognostic biomarker in T-ALL can be further extended to study the amount of minimal residual disease present in the patients and may provide a better means to analyse the response to chemotherapeutic treatments. Comparing the immunophenotype of $\gamma\delta$ + T-ALL and $\alpha\beta$ + T-ALL may lead to identification of a new subset in T-ALL that can respond better to therapies.

**PRANITA KAMBLI (PI: DR.
PRASHANT PHALE)**

**“UTILIZATION OF LIGNIN
DERIVED INTERMEDIATES,
FERULIC ACID AND VANIL-
LIC ACID BY PSEUDOMONAS
PUTIDA CSV86”**

Lignin, a natural, aromatic, and recalcitrant polymer owns 20% of the organically fixed carbon, not readily utilisable as a source of energy. *Pseudomonas putida* CSV86 is known to grow on aromatic compounds favouring its exploitation for recycling the carbon fixed in such compounds. The study on the utilization pattern of CSV86 on ferulic acid and vanillic acid in presence of glucose has shown a diauxic growth profile in which glucose utilisation was observed in second log phase. This shows that CSV86 has the potential to not only decrease the load on simple sugars for fermentation to alcohol but also contribute towards better carbon recycling by converting the carbon trapped in recalcitrant form into a simple, readily utilizable one.

**MANASI (PI: DR.
PRAMOD WANGIKAR)
CARBON DIOXIDE SE-
QUESTRATION BY MI-
CROALGAE SCENEDES-
MUS AND ITS EFFECT
ON THE BIOCHEMICAL
COMPOSITION**

In an attempt to contribute to decrease global warming by CO₂ sequestration, microalga *Scenedesmus* sp was exploited for its ability to fix carbon dioxide and produce lipids and other value added products. The effect of CO₂ tolerance on *Scenedesmus* sp. and thereby the biomass yield and biochemical composition was evaluated in the study. *Scenedesmus* sp. was found to tolerate 10% CO₂ level and hence can be used for sequestration of carbon dioxide from the industrial waste water.

**ALFIYA FIRFIRE (PI: DR.
PRAMOD WANGIKAR)**

**“DUAL EXPRESSION OF DE-
HYDROGENASES FOR ASYM-
METRIC KETONE REDUC-
TION”**

An increasing demand of enantiopure intermediates in various industries has made biocatalysis a good alternative. Alcohol dehydrogenases (ADH) from microbial sources are important tool for the conversion of ketones to chiral alcohol. The focus of this study was to construct a novel whole cell biocatalyst derived from *E. coli* DE3 (BL21a) through expression of genes encoding alcohol dehydrogenase from *Geotrichumcandidum* and glucose dehydrogenase from *Bacillus subtilis*. With the construction of dual expression system and the use of whole cells, the recombinant cells derived from *E. coli* DE3 (BL21a) acts as a good biocatalyst for the biotransformation of ketones into corresponding alcohols with an enantioselectivity of almost 100%.

IIT BOMBAY

2013-15

HARSHADA MALVI (PI: DR. RUCHI ANAND)

***“STRUCTURE BASED PROTEIN ENGINEERING TO CONFER SELECTIVITY OF
GUANINE DEAMINASE”***

Structure based protein engineering is the method adopted widely to study proteins. The interactions of guanine deaminase, a zinc assisted enzyme catalysing the conversion of guanine to xanthine, was elucidated using mutants obtained from *Nitrosomonas europaea* (NE0047). It is also found to demonstrate a secondary activity against ammeline. As hypothesized, the study it concluded that the mutants of NE0047 (E143D, F48A, F141A and N66A) accept guanine as a substrate and the mutant N66Q accepts ammeline as a substrate and catalyze zinc assisted deamination reaction.

PRIYA (PI: DR. PRASHANT PHALE)

***“MOLECULAR ASPECTS OF HALOTOLERANT, PSEUDOMONAS SP. STRAIN
C7 INVOLVED IN CARBARYL DEGRADATION”***

Halotolerant bacterium *Pseudomonas sp* strain C7 for bioremediation of waste water and saline lands having on-field potential was the interest of study. This strain, isolated from estuary at Thane creek area near Mumbai, was reported to tolerate sodium-chloride upto 3.5% and utilize carbaryl (upto 1%) as a source of carbon and energy. The stable, non-curable carbaryl degrading property of the bacterium was traced to be originating from genes encoded in chromosomal DNA of the organism by PCR amplification of genes for enzymes [carbaryl Hydrolase (CH), 1-naphthol 2-hydroxylase (1NH), 1,2-dihydroxynaphthalene dioxygenase (1,2-DNDO) salicylaldehyde Dehydrogenase (SALDH) and gentisate 1,2-dioxygenase (GDO)] involved in carbaryl degradation.

KAHAAN PARIKH (PI : DR. RAJANI KANT CHITELLA)

“CLONING, OVER EXPRESSION AND PURIFICATION OF RICE BRCA1”

Rice (*Oryza sativa*), one of the principal food crops of the world, is an ideal model organism for genetic and genomic studies. BRCA1 human homolog is well studied in *Arabidopsis thaliana*, however, its presence in rice have not been studied. The study undertaken is the first to report about cloning of BRCA1 in pET29a, over expressed in *E.coli* BL21 (DE3) and purified using Ni-NTA affinity chromatography. It was found that rice BRCA1 was of the size 2.7 kb size and the expressed protein showed a molecular weight of 90kD.

NIKHIL BARDESKAR (PI: DR. VENUGOPAL MIKKILINENI, MAHYCO, JALNA)

“MOLECULAR CHARACTERIZATION AND DIVERSITY ANALYSIS OF WHEAT GENOTYPES USING MICROSATELLITE MARKERS”

Diversity is a prerequisite to achieve plant breeding goals and with this objective, diversity analysis of eight wheat genotypes using microsatellite markers was initiated using microsatellite markers. The results obtained were used to create a dendrogram that categorized eight wheat genotypes into two major clusters of which one major cluster was further divided into three sub-clusters. The study revealed a genetic similarity range of 0.71 to 0.97.

ASHWINI CHITTIMILLA (PI : DR. SUDHANSHU SAXENA)

“STUDY ON THE FUNCTIONAL PROPERTY OF APPLE”

Apple is known for its impressive list of phyto-nutrients and anti-oxidants which are known to play the role of antimutagens. *E.coli* rifampicin resistance assay was employed to study the anti-mutagenicity of apple and proanthocyanidin was found to be the most potent anti-mutagen present in apple.

JOSNA JACOB (PI : DR. RAJANIKANT CHITTELA)

“CLONING, OVER EXPRESSION AND PURIFICATION OF RICE (ORYZA SATIVA) TRUNCATED TRANSLIN PROTEINS”

Translin, a highly conserved RNA and DNA binding protein, is implicated in a broad spectrum of biological activities including cell growth, regulation, spermatogenesis, neuronal development, mRNA processing, genome stability, RNAi activity and carcinogenesis. Studies have revealed that translin forms multimeric structure (octameric ring) essential for its functional activities at C- terminal domain. Thus the study aimed at generating translin protein of rice with C- terminal truncations to provide critical insight in identification of the amino acids responsible in octamer conformation.

2012-14**YAMINI NAIR (PI: DR. ARCHANA JOSHI SAHA)****“PHYSIOLOGICAL, BIOCHEMICAL AND MOLECULAR STUDIES IN *CICER ARIETINUM* L. (CHICKPEA)”**

India is the highest contributor in production of chickpea which is grown in the tropics as rabi crop. Hence it is prone to terminal drought stress which causes flower drop and reduced grain filling leading to a decrease in yield. Therefore, the present study was undertaken to study drought tolerance at physiological, biochemical and molecular level. The information generated in the study will be useful in selection of parental genotypes for crossing program to generate increase variability and reduce phytic acid content in chickpea genotypes to increase its nutritive value.

2013-15**ANJU JAMES (PI : DR. S CHATTOPADH-YAY)****“EVALUATION OF (+) – DODONEINE AS A NEW ANTI-CANCER AGENT”**

Dodoneine [(R)-6-[(S)-2-hydroxy-4-(4-hydroxyphenyl)butyl]-5,6-dihdropyran-2-one] is a naturally occurring dihydropyranone phenolic which is isolated from *Tapinanthus dodoneifolius* DC Danser, also known as African mistletoe. Many research studies revealed that dodoneine acts as an inhibitor of several human carbonic anhydrase isoforms, offering a possibility of development a novel anti – tumor agent. The aim of the project was to screen the anti-cancer effect of (+)- dodoneine against human squamous carcinoma A431 cell line.

2013-15**CYNTHIA SOANS (PI : DR. ROJA GOPALAKRISHNAN)****“PRODUCTION OF SECONDARY METABOLITES FROM MEDICINAL PLANTS *RAUWOLFIA SERPENTINA* AND *ADHATHIDA VASICA*”**

Plant tissue culture for evaluation of alkaloids having medicinal properties and used widely in Ayurveda was the topic of study. *R. serpentina* (Apocynaceae) and *A. vasica* (Acanthaceae) were the candidates for callus culture, shoot culture and hydroponics system using Steinberg medium. The alkaloids Ajmaline of the plant *R. serpentina* and Vasicine of *A. vasica* was evaluated by HPLC and it was found that shoot cultures gave higher yield of these alkaloids in the medium ½ MS, MS + BA (1 mg/l) + NAA (0.1 mg/l) and B5 + BA (1 mg/l) + NAA (0.1 mg/l).

JENEVIEVE D'SOUZA (PI-DR. SMITA MITBAVKAR)

“RESPONSE OF PICOPHYTOPLANKTON AND NANOPHYTOPLANKTON FROM THE DONA PAULA BAY TO NUTRIENT ENRICHMENT”

Phytoplankton are the principal components that sustain life in the world's oceans contributing to biomass production, nutrient cycling and carbon flux. A study was conducted on the native phytoplankton community of Dona Paula Bay to evaluate the response of picophytoplankton and nanophytoplankton to nutrient enrichment. The effect of potentially growth-limiting nutrient such as N, P, Si and their combinations N+P, Si+N, Si+P, N+P+Si was to test the hypothesis if both size groups respond similarly to nutrient enrichment. The results indicated that changes in the phytoplankton community structure are directly influenced by the availability of potentially limiting nutrients and the ability of the nano and picophytoplankton to scavenge these nutrients.

SAMANTHA D'SOUZA (PI-DR. JAGDISH PATIL)

“TO EVALUATE THE EFFECT OF PROLONGED DARKNESS ON THE DEVELOPMENT OF MARINE DIATOM BIOFILMS”

The fouling diatoms are known to survive under dark conditions in the intertidal sediment regions as well as the ships' ballast water tanks. In this study, an attempt has been made to study the effect of prolonged darkness on the development of marine diatom biofilms for a period of 35 days. Of the 25 diatoms species recorded only *Amphora* followed by *Navicula* community were able to remain viable and photosynthetically healthy under dark conditions without undergoing asexual reproduction. This study can help in understanding the diatom ecology in intertidal sediment regions, the ships' ballast water tanks as well as an effective antifouling strategy.

CRYSTAL FERNANDES (PI-DR. ANIL AC)

“SPATIAL VARIATION IN BACTERIAL POPULATION IN A TROPICAL ESTUARY (ZUARI, GOA)”

Estuaries are known to be the most productive aquatic ecosystems. Therefore studies on distribution of bacterial community in such diverse estuarine ecosystems are important in determining the overall ecology and the health status of these waters with respect to public health. In the study eight stations in the Zuari estuary were sampled twice during the post monsoon season to study the variations in bacterial population. A positive correlation between the amount of nutrients and the observed bacterial abundance and diversity in the Zuari estuary was observed.

**SAMIA GOMES (PI-DR. LISETTE
DESOUZA)**

***“ISOLATION AND IDENTIFICATION
OF METAL TOLERANT RHIZO-
SPHERE BACTERIA FROM SEDIMENT
OFF KOCHI (SOUTH INDIAN COAST)
AND ASSESSMENT OF ITS CHEMICAL
AND BIOLOGICAL ACTIVITY”***

Bioaccumulation of different heavy metals at different levels in the food chain has become a grave issue and therefore bioremediation of these metals has gained much importance in recent years. Thus, in this study, attempt to analyse the biological and chemical activity of metal tolerant bacteria from polluted sediments around the rhizosphere of *Eichhornia crassipes* and their application in bioremediation was made. In addition all cultures were screened to understand the flocculating ability since there is a strong correlation between the flocculating activities of bio-flocculants and their ability to remove heavy metals. *Bacillus* sp. proved to have the maximum flocculating activity. This additional ability of the metal tolerant bacteria will allow their use or their bio-products as an alternative for the removal and recovery of toxic metal effluent, dyes and pesticide economically and effectively from industrial effluents/wastewaters.

**SNEHA NEWALKAR (PI-DR. SMITA
MITBAVKAR)**

***“GROWTH AND GRAZING LOSS RATES
OF NANO AND PICOPHYTOPLANKTON
IN THE COASTAL WATERS OF GOA”***

One of the main aspects of studying marine food web dynamics is to understand the trophic relationship between producers and their grazers and their sustainable interactions. Assessment of the growth and grazing rates of nanophytoplankton (<20 μm in size) and picophytoplankton (<3 μm in size) at five stations i.e. Dona Paula, Cortalim, Campal and Verem (surface and bottom) during November 2013 to March 2014 revealed that in a marine habitat, HNF grazing could serve as a link between the microbial and classical food web wherein carbon is transferred up the food web. However, other factors can influence phytoplankton biomass like viral lysis, physiological senescence etc.

AROKIA RANI (PI: DR.ANITA SAMAGOD)

“SMALL SCALE CELL CULTURE PRODUCTION AND PURIFICATION OF RECOMBINANT PROTEINS (HORMONE) FROM CHO CELLS”

Recombinant therapeutic proteins have changed the face of modern medicine and they continue to provide new and effective therapies for numerous diseases ranging from cancers to infertility. The study was aimed towards production, purification and analysis of recombinant hormone for therapeutic use produced from Chinese hamster ovarian (CHO) cell lines. This involved the study of the growth curve of the CHO cell lines and the production of recombinant hormone to obtain high yields on a larger scale using fed batch culture.

**BHARAT SERUM AND
VACCINES LTD.**

2013-15

ALIFEYA SAEED (PI: MS. KRIPA MURZELLO, BHARAT SERUMS AND VACCINES LTD. THANE)

“PURIFICATION OF TETANUS TOXIN AND TOXOID”

Tetanus toxin is regarded as the second most toxic substance with a human lethal dose of 2.5ng/kg. This dreadful disease can be prevented by immunization with tetanus toxoid or treatment with tetanus anti-toxin. However, these proteins can elicit an allergic or anaphylactic reaction. It is therefore necessary to purify the toxins and toxoids in order to reduce the foreign content and further to produce monoclonal antibodies over the generally used polyclonal antibodies. For this purpose, the study highlights the process for purifying the tetanus toxin and toxoids samples, ultimately to obtain a purer form of fragment C. The papain digestion holds an important place in isolating the fragment C of the toxin and toxoid as it cleaves the F(ab) region and retains the intact 50kD fragment yielding the fragment C.

KRUPA VYAS (PI: DR. FIROZ AHMAD, SRL LIMITED, MUMBAI)

“MOLECULAR ANALYSIS OF PDGFRA GENE EXON 12 MUTATIONS IN GASTROINTESTINAL STROMAL TUMORS (GIST) IN INDIAN PATIENTS”

Gastrointestinal Stromal Tumors (GISTs) are mesenchymal neoplasms that originate from the gastrointestinal tract. Approximately 80% of GISTs have an oncogenic mutation in the *KIT* tyrosine kinase, a subset (5%–7%) of GISTs have an activating mutation in the *KIT*-homologous tyrosine kinase Platelet Derived Growth Factor Receptor Alpha (*PDGFRA*). These gene mutations play a critical role in the biological behaviour and treatment of GIST. The purpose of this study was to analyse *PDGFRA* exon 12 gene mutations in Indian patients with GIST and correlate the data to the clinicopathological information. From a total of 70 cases studied, mutations were detected in 3 cases. The mutations observed were P577R, N576R and R558Y and were clustered between 558-577 *PDGFRA* amino acid residues. A consistent single nucleotide change of adenine to guanine at nucleotide position 1707 was detected in all the cases. The data obtained was correlated to clinicopathological information available.

JIBI MATHEWS (PI: DR S ASHA NAIR, RAJIV GANDHI CENTRE FOR BIOTECHNOLOGY, KERALA)

“TO STUDY THE ROLE OF DCLK1 GENE IN COLORECTAL CANCER”

Colorectal is the third most common cancer with high morbidity. Cancer Stem Cells (CSC) resident in the colorectal tumour location play an important role in the resistance and relapse of the tumours after conventional chemotherapy. Thus selectively targeting these unique CSC's can be viewed as a significant strategy in combating the disease. Doublecortin-like kinase 1 (DCLK1), a microtubule-associated kinase expressed in post-mitotic neurons, has been identified as a putative intestinal and colon cancer stem cell surface marker. A comparative analysis of the expression rate of this marker with already known microarray colorectal datasets was conducted. Thus the project can be considered as a starting step in understanding the possible role of DCLK1 gene in colorectal carcinogenesis and as a possible candidate for colorectal antitumor therapy.

SHARANG KOLWALKAR (PI: DR YOGESH SOUCHE, NCCS)

“IN SILICO ANALYSIS OF DIFFERENCES IN GUT MICROBIOTA AMONG MONOZYGOTIC AND DIZYGOTIC TWIN PAIRS FROM TWO CONTINENTS”

Determining the factors that drive differences in the gut microbiomes of individuals is necessary to evaluate nutritional and therapeutic strategies aiming at the gut microbiome, because of the indispensable role of the gut microbiota in our overall health and well-being. Previously, dizygotic co-twins were reported to be not more different from each other than monozygotic co-twins. *In silico* analysis of the differences in gut microbiota among Mono- and Dizygotic twin pairs from two continents inferred that monozygotic co-twins are indeed more similar to each other than dizygotic co-twins w.r.t. *Bifidobacterium* and *Akkermansia*, and that the differences between mono- and dizygotic twin pairs are more conspicuous in the first year of life. We thus infer that, when specific genera are looked at individually, the role of genetics in shaping the gut microbiome becomes evident.

NCL, PUNE

JYOTI BHARTI (PI : BHASKAR G. GAIKWAD)

“THE INTER COMPARISON OF VARIOUS PLANT EXTRACTS AND RELATED COMPOUNDS FOR TYPE II DIABETES USING YEAST AS A MODEL ORGANISM”

The aim of this study was to study the effect of anti-diabetic plant extracts on the glycogen and glucose metabolism. Glucose concentration was determined by DNSA method and glycogen estimation was done by potassium iodide method. Differences in glucose and glycogen content seen in the eleven samples studied are majorly because of the various unknown compounds in the extracts.

ZENIA MOTIWALA (PI : DR. KIRAN KULKARNI)

“STRUCTURAL STUDIES ON AN ATYPICAL RHO GTPASE: RHOH”

Rho GTPases are small, monomeric GTP binding proteins and belong to the Ras superfamily. RhoH is a single member subfamily of Rho GTPases and belongs to the atypical sub group expressed only by cells of the hematopoietic lineage and is known to play a key role in different types of lymphomas. RhoH is GTPase deficient and cannot be regulated similar to other Rho proteins as it is constitutively active. To understand its regulation, elucidation of its atomic structure by X-ray crystallography was necessitated. The pre-requisite for crystal study is to obtain purified protein in high concentration which was attempted using *E.coli*. However, due to the formation of inclusion bodies, eukaryotic expression system is suggested for future studies.

DEVENEY DASILVA (PI : DR. SURESHKUMAR RAMASAMY)

“CO-EXPRESSION STUDIES OF GET3 WITH HETEROLOGOUS TA PROTEINS”

Classical membrane proteins possess their targeting information at the N-terminal, whereas a specialized set of membrane proteins termed as the Tail Anchored (TA) Proteins bear their TMD at the C-terminal. The pathway which is responsible for correct insertion of TA proteins into membranes is known as the Get3 pathway in yeast previously known as the Golgi to ER trafficking pathway and TRC/Asn1 pathway in mammals and is highly conserved from yeast to mammals. Reports have shown interactions between the yeast homologue of Get3 with TA proteins from archae bacteria. Therefore, the following studies were carried out to observe the interactions between Get3 obtained from *Arabidopsis thaliana* with TA proteins obtained from archae.

JYOTI RAWAT (PI : DR. MUGDHA GADGIL)

“THE APPLICATION OF PEROXIDE LOADED HYDROGELS TO OVERCOME OXYGEN LIMITATION IN SMALL SCALE CULTURE PLATFORMS”

Current small scale culture platforms suffer from drawbacks of low aeration capacity along with low oxygen solubility in aqueous phase which causes oxygen limitation altering the product yield and quality, thus affecting the overall commercial large scale production of fermentation products. In this study we report the application of hydrogels loaded with calcium peroxide and magnesium peroxide hence called the Calcium peroxide loaded hydrogels (CplH) and Magnesium peroxide loaded hydrogels (MplH) to increase the biomass yield and plasmid yield when compared to the control cultures. However, the effect of CplH and MplH on different plasmids and their role in increasing the plasmid yield needs to be established with more experiments.

MANISHA YADAV (PI : PROF. SHYAMALAVA MAZUMDAR, TIFR)

“EFFECT OF SITE DIRECTED MUTAGENESIS ON THERMODYNAMIC AND THERMAL STABILITY OF CYP175A1 ENZYME”

The work focussed on knowing the effect of site specific mutation on thermodynamic and thermal stability of CYP175A1, a thermostable P450 monooxygenase enzyme from *Thermus thermophilus* HB27, using its mutant K88C. By the application of various analytical techniques, the study showed that increase in temperature decreases the stability of protein. It was also seen that the tertiary structure of the protein is less stable than the secondary structure.

RAJLAKSHMI PANIGRAHI (PI : DR. RAMAKOTI, TIFR)

“CONSTRUCTION OF UBIQUITIN POLYGENE AND BIOPHYSICAL CHARACTERIZATION OF TRYPTOPHAN MUTANTS OF UBIQUITIN, SUMO1 AND SUMO2”

Ubiquitin is a small protein involved in the proteosomal degradation and consists of a characteristic fold exhibiting β - clamp geometry. SUMOs are members of the ubiquitin-like protein family that act as reversible post-translational modifiers of proteins in eukaryotes. To construct ubiquitin polygene for the single molecular atomic force spectroscopy studies and to get an insight in the bulk properties of these proteins, the thermodynamic properties and unfolding pathways of ubiquitin, SUMO1 and SUMO2 by sing Steady state fluorescence spectroscopy. The C_m values indicate that ubiquitin is thermodynamically more stable as compared to the SUMO 1 and SUMO 2. The sigmoidal fit of the fluorescence emission spectra as a function of urea (denaturant) concentration indicates a two state folding pathway for ubiquitin and SUMO proteins.

NIKHIL THANGIAH (PI: DR.CECILIA DAYARAJ, NIV)

“INTERACTION OF CORE PROTEINS OF DENV WITH MITOCHONDRIAL PROTEINS”

The study showed that Dengue virus (DENV) infection of BHK-21 cells caused a morphological change in the mitochondria within fifteen minutes of virus addition. Later, 24 hours post infection, co-localization of viral core proteins with the mitochondria was seen. A change in mitochondrial morphology was indicative of DENV induced apoptosis. This study was undertaken to confirm the targeting of DENV core protein to the mitochondria by biochemical methods using cells stably transfected with core gene of DENV.

AMIT KUMAR (PI - DR. MADHUPARNA BANERJEE, BIRSA AGRICULTURAL UNIVERSITY, RANCHI)

“GENETIC AND PHYTOCHEMICAL EVALUATION OF AGROBACTERIUM RHIZOGENES MEDIATED HAIRY ROOT INDUCTION ON OCIMUM SANTUM”

Genetic and phytochemical evaluation of *Agrobacterium rhizogenes* mediated hairy root induction on *Ocimum sanctum* formed the basis of this study. Comparison between two strains of *Agrobacterium rhizogenes*, ATCC 15834 and MTCC 2364 for their property of inducing hairy root culture was analysed by molecular characterization of the induced hairy roots through PCR using gene specific markers to confirm the presence of two oncogenes *rol B* and *aux 1* and further its phytochemical analysis to check the concentration of eugenol, essential oil obtained from *Ocimum sanctum*. It was observed that both the strains showed optimum results at similar conditions of temperature and having similar transformation rate but varied co-culture time and induction time.

OSCAR (PI - DR. RENU TRIPATHI, CSIR-CENTRAL DRUG RESEARCH INSTITUTE, LUCKNOW)

“EVALUATION OF VITAMIN D AS ADJUNCT THERAPY IN RODENT MALARIA MODEL”

Malaria caused by *Plasmodium falciparum* is posing greater challenges with mortality rates from cerebral malaria (CM) being the highest. The development of resistance against almost all anti-malarial drugs has added to the increased mortality. The present effective treatment for *P. falciparum* is Artemisinin derivatives. In the study where Vitamin D and Artemisinin was administered for CM, the results show a diminished systemic inflammatory response by lessening TNF- α and IFN- γ cytokines in circulation and clearing the parasites from host erythrocytes. Vitamin D also decreased expression of cytoadhesion molecules (ICAM-1, VCAM-1) in brain which further dampened the amassing of pathogenic T cells in brain and eventually improving blood brain barriers of *Plasmodium berghei* ANKA (PbA) infected mice (animal model of experimental cerebral malaria (ECM)).

LINO CARDOZ (PI - DR. VIVIEN AMONKAR, PGDBT, ST. XAVIER'S COLLEGE, AUTONOMOUS, MUMBAI)

“ISOLATION OF LACTIC ACID BACTERIA AND ITS POTENTIAL APPLICATION FOR CLA PRODUCTION”

Conjugated linoleic acid (CLA) has found significance due to its anti-carcinogenic effect along with other health benefits and the global market for CLA is projected to cross \$199 Million by the year 2017. The present study focuses on isolating Lactic Acid Bacteria (LAB) from dairy products for the production of CLA from unsaturated fatty acids. Thus the potential of LAB for the production of CLA from castor oil hydrolysate and milk was estimated keeping the economic considerations in mind.



CONVERSATION WITH MS. ESCHERY!

“Silence has surrounded us as if we are at the end of the world,” she said. Listening to this interviewer Franklin smiled and replied, “I can empathize with your awkwardness but this is just a casual talk. We are all good humans”. She took a deep breath and continued, “My name is Eschery. I was born in Mrs. Mariotema’s beautiful appendix. I agreed for this Interview only so that I could share my life experiences with you humans. Soon after my birth, one of my *coli* friends gave me an extra chromosomal DNA strand because of which I could survive the demons Ciprofloxacin and Nalidixic acid. I am very confident that my isolation has to do something with it!”

Franklin continued making her feel comfortable and said, “we never thought of it from your perspective.” She acknowledged and responded, “we never come with our cops to sue you for not asking our informed consent which is a legal requirement for your research studies. You spin us, you sometimes burn us. You freeze us and give heat shock treatments just to force in some DNA strands. These are just a few of the atrocities that you humans torture us with! Despite we giving you benefits, we are been ill treated. Nonetheless, giving you an advice for your kids. Ask them to pull down on junk food. It gets too difficult for us to clean up your intestines!”

Franklin said slyly saying that its her and her families that cause humans enteritis. Eschery seemed furious. “For your defense, you take those chemical compounds that kill us eventually. A tip for that. Do complete the drug course, otherwise you make us adapt to them and we become resistant instead!” Franklin wondered as if he had opened another door for understanding antibiotic resistance. Suddenly, Eschery collapsed from her seat and she was rushed to the Microbiology lab. Saddened by her situation, he took over and said, “Eschery was checked up and the specialists found her to be critical due to oldage.” “She was under observation for some more time but dint show any recovery. And it was her demise. She was sacrificed for the extra chromosomal DNA content and many more proteins,” said Dr. Rodrigues.

Franklin gave a last note, ‘We humans are not devils. Eschery gave up her last breath enlightening us with knowledge. Indeed she kindled a fire in us about antibiotic resistance and have given us another perspective for research. Thank you and rest in peace, Eschery!’

VINEETH DANIEL

MSC PART II, 2015-16



**Dr. Shiney Peter, Dr. Biswa Prasun, Chatterji,
Ms. Norine Dsouza**



Prashant Manchekar, Rajesh Mahadik



Batch of 2015-16

THE HEART OF OUR PGDBT

