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UNIVERSITY COURSES CAMPUS

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EDITOR'S MESSAGE

“To me, the greatest pleasure of writing is not about what it is about, but the inner music the words make..... Truman capale”.

Dear Readers,

In agreement with the above quote, I find writing as the most valuable literary expression. We are really proud and exuberant to acclaim that we are ready to finally introduce our very own

e-magazine... The magazine delves into various branches of biological science from chaos of microbe world to orderly laws of gene editing. It also consists of horizon of information like Articles, Science facts, Quizzard, Achievements and events at School of Biosciences. We have put in relentless efforts to bring excellence to this treasure trove. Helen Keller rightly said that the “World is moved along not only by the mighty shoves of its heroes, but also by the aggregate of the tiny pushes of each honest worker”. This herculean task of editing this school magazine would not have been possible without the sincere support of the members of the Editorial Board.

It is a fine thing to have ability, but the ability to discover ability in others is the true test. I am really thankful to our respected Director ma'am for entrusting me with the responsibility of being a part of the Editorial Board.

I heartily endow all the readers my best wishes and hope this souvenir will enjoy your critical acclaim and prove itself as a vital role in exploring magical world of science.

GUT MICROBIOME IMPACTS SLEEP AND HEALTH

Dr. Surabhi Johari

IMS UNIVERSITY COURSES CAMPUS GHAZIABAD

Right now, our gut is filled with millions of bacteria living in an ecosystem called the microbiome, which helps us to digest food, process waste, and deal with threats like viruses. Scientists have been discovering that the complex microbiome we all have in our intestines does a lot more than just chew up food; it's also been shown to influence everything from our moods to the ways we deal with stress. One surprising thing our gut health can impact? Sleep, according to science, has a particularly strong relationship with gut health; the healthier and more flourishing our gut microbiome and function, the better we snooze, and vice versa. Sleep problems elevate risks for diabetes, cardiovascular disease, cancer, and premature death, perhaps in part through their effects on metabolism and weight. Both sleep restriction and circadian disruption—sleep's misalignment with the body's internal clock—alter appetite hormones in a way that makes people hungrier and eat more. The gut microbiota may mediate this effect, because gut microbes also affect production of leptin, an appetite-stimulating hormone. After a night of poor sleep, people also tend to eat more food high in saturated fat and simple carbohydrates, exacerbating the effects of circadian misalignment and sleep loss (Li, Y., Hao *et al.* 2018). Even overweight people on a calorie-restricted diet who slept poorly lost less fat than those on the same

same diet who slept well, suggesting that sleep disruption slows fat metabolism regardless of calorie intake. Moreover, healthy people who were restricted to 4 hours of sleep for six nights showed a 40% decrease in glucose clearance, comparable with diabetic levels; conversely, extending the sleep of chronically short sleepers enhanced glucose metabolism. Likewise, circadian misalignment decreases insulin sensitivity, apart from and compounded by the effects of sleep loss. Glucose metabolism does not seem to habituate to sleep disruptions, suggesting that the risks accumulate over time. As described earlier, microbiota data account for 22% of the variability in fasting glucose. A theoretical review conceptualized sleep loss and acute circadian disruption as physiological stressors, noting that periods of shorter or no sleep often lead to increases in afternoon and early evening cortisol levels, which promote visceral fat storage and elevate circulating glucose. Insofar as sleep dysregulation triggers a stress response, it is also proposed that alterations in the gut microbiota may help explain sleep-related risks for obesity and metabolic diseases (Insomnia and Depression). As discussed, gut microbes help maintain metabolism, nutrient absorption, and the intestinal barrier, and stress and high-fat diets induce gut dysbiosis (Lombardo *et al.*, 2013). The sleep-dysbiosis link has support in rodent models:

has support in rodent models: within 5 days of sleep deprivation, intestinal bacteria appeared in rats' mesenteric lymph nodes, outside the intestine, implying rapid bacterial translocation. Mice with genetically induced circadian disruption also had lower gut microbiota diversity compared with wild types . Unhealthy diet may further exacerbate these effects: in mice fed a high-fat diet, gut microbes themselves showed altered circadian rhythms, which in turn were associated with changes in the mice's own circadian clock gene expression and weight gain. Taken together, when marital hostility disrupts sleep, it likely triggers maladaptive gut microbiota responses and metabolic cascades as well. In turn, sleep loss can interfere with partners' ability to read each other's emotions and fuel hostility, forming a risky cycle. Furthermore, a few nights of shorter sleep prime larger inflammatory responses to marital conflict, suggesting that the physiological stress of sleep restriction may interact with marital stress to heighten health risks. Exercise increases gut motility, and faster colonic transit times increase microbiota diversity. Regular physical activity changes the microbial community's composition and also modulates bacterial metabolism via production of beneficial short-chain fatty acids, which helps prevent gut barrier dysfunction and limits the resulting systemic inflammation. The link between the gut and sleep is a pretty strong one. We need to still discover the ins and outs of its complexities, but it's a safe bet to assume that if we are having sleep issues your gut is involved — and that if your gut is suffering, your sleep likely will, too (M., A. 2017).

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M., A. (2017). Role of insomnia in depression and stress. *International journal of advanced research*, 5(11), pp.1243-1247.

***“If you have the courage to begin,
You have the courage to succeed”***

FASCINATING WORLD OF SCIENCE



Stomach acid is strong enough to dissolve stainless steel. Your stomach digests food thanks to highly corrosive Hydrochloric acid with a pH of 2-3. This acid also attacks on stomach lining, which protects itself by secreting an alkali Bicarbonate solution.

Snail's teeth are, the strongest natural material on Earth able to withstand pressures high enough to turn carbon into Diamond.

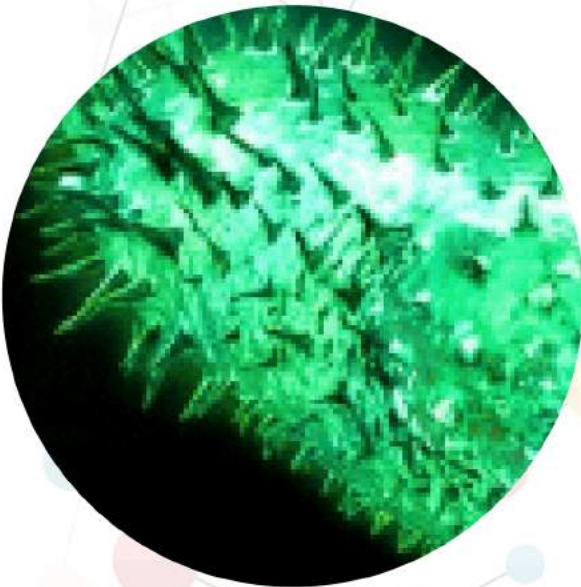


The 'Black Diamond' is a rare apple with a jet black hue, a taste sweeter than honey, and crispness unmatched by any other apple. An apple you will only find them in Tibet.



The medical community used to believe that pruning was caused by your fingers absorbing water. It is now known that Prune fingers are the result of blood vessels that constrict below the surface of the skin. The condition is tied to the function of the nervous system.

The average Human loses 85,000 Brain Cells each day, but only regenerates 50 new ones.



There are more bacteria that live and work in one linear centimeter of your lower crotch than all the humans who have ever lived on Earth.

Success consists of going from failure to failure without loss of enthusiasm...

Microbes in International Space Station

Farman Khan

B.Sc. Microbiology

IMS GHAZIABAD -UNIVERSITY COURSES CAMPUS

Cleaning in space isn't something that you tend to hear much about, even though keeping the International Space Station (ISS) spic and span is a top priority for the astronauts who call it home.

This is because ISS is a close system, meaning the air inside has to be continually recycled so that it stays fresh and clean, the environment control system is packed with air filters to get rid of dust and germs. The astronauts also have to do cleaning and vacuuming, and this is a regular part of life abroad the space station.

All of this litter has to be dumped somewhere, and normally the space station just jettisons all its trash in a giant capsule that burns up in the Earth's atmosphere. But to researchers, the dust inside the air filter and vacuum cleaner bag is too valuable to just throw away. Instead it makes its way back to earth, where it ends up in the hands of Dr. Kasthuri Venkateshwaran - A Microbiologist working at NASA's jet propulsion lab.

Venkat's job is to monitor the microbes on the space station, to see if any of them could pose a threat to the astronauts on board, and to search microbial species which we have never seen before.

The group had been busy analysing a 40 month old HEPA filter from ISS that was brought back to earth. HEPA stands for high efficiency particulate arrester and these filters are able to trap anything larger than 0.3 microns (0.0003mm) across, can collect 99.7% of microbes passing through them. Having travelled to space and back, these filters have to be handled carefully to prevent any contamination from terrestrial microbes. "We have cleaned a room to open such precious sample", says Venkat. "So I opened it here, we collected the debris from the filter paper, and then carried out a microbial analysis."

When they looked at the microbes that are orbiting the earth with the astronauts, the team found a new species of microbes, and as a tribute to **Dr. APJ Abdul kalam** they named this microbe as "*Solibacillus Kalamii*"

They described their findings in the society's ***International Journal of Systematic and Evolutionary Microbiology***. This new species looks well adapted to survive in the difficult conditions **250 km** above us.

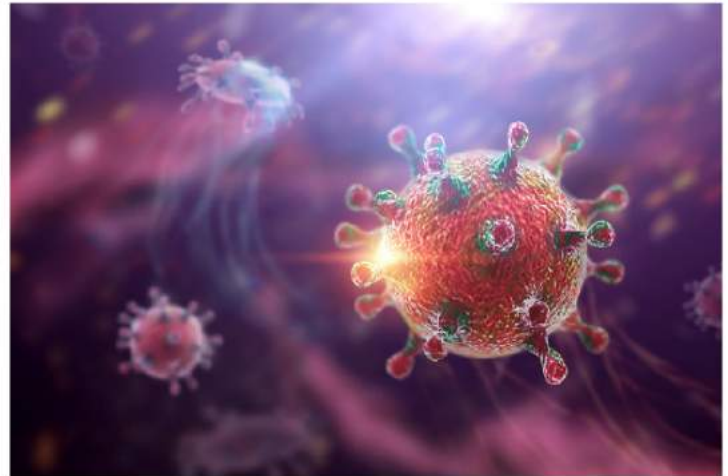
"*Solibacillus kalamii*" actually possesses an extra layer (on its outer surface) "Certain microbes have an extra layer rich in lipoglycoprotein, a kind of blanket. This can be used as protective agent against radiation, like sun screen".

We hope that bio compounds like these could one day incorporate into space suits, and provide extra protection to astronauts when they are outside the space station.

The ISS is a great location to look for compounds like this, as only resistant microbes which adapt to these tough conditions will survive. “High radiations, microgravity, high CO_2 these are the conditions which make some microbes to perish, but other resistant microbes that develop adaptive strategies can also survive.”

Among these one is Micro-10, where the group sent the fungus *Aspergillus nidulans* to the ISS. The aim is to explore whether microgravity allows microbe to produce novel compounds that could be used as drug or within biotechnology.

Another is a project called MT-2, which is looking specifically for pathogens on board the space station, to understand how microbes may influence health.



“ In a closed system the astronauts are constantly shedding microbes and picking them up” - its like living in an intensive care unit, this kind of microbiological research is especially important for looking the effects of long haul space flight. If we ever do make it to Mars, the trip would take 6-8 months - it would be a wasted journey if the astronauts got sick before they arrived.

Do not let the opinions of others consume you

Self-confidence is the first requisite to great undertakings.

The Nobel Prize in physiology or medicine was awarded jointly to James P. Allison and Tasuku Honjo "for their discovery of cancer therapy by inhibition of negative immune regulation.

Cancer kills millions of people every year and is one of humanity's greatest health challenges. By stimulating the inherent ability of our immune system to attack tumor cells, this year's Nobel Laureates have established an entirely new principle for cancer therapy.

James P. Allison studied a known protein that functions as a brake on the immune system. He realized the potential of releasing the brake and thereby unleashing our immune cells to attack tumors. He then developed this concept into a brand new approach for treating patients.



In parallel, Tasuku Honjo discovered a protein on immune cells and, after careful exploration of its function, eventually revealed that it also operates as a brake, but with a different mechanism of action. Therapies based on his discovery proved to be strikingly effective in the fight against cancer.

Allison and Honjo showed how different strategies for inhibiting the brakes on the immune system can be used in the treatment of cancer. The seminal discoveries by the two Laureates constitute a landmark in our fight against cancer.

NASA USES A DEVICE CALLED “MINION”

Dr. Rakesh Kant Kamal

Ph.D. (IIT-ISM) Dhanabd, Jharkhand

ABOUT **NASA**

The National Aeronautics and Space Administration (NASA) for the first time have successfully sequenced DNA in the International Space Station (ISS). The Genome sequencing was undertaken for the first time in microgravity as part of Biomedical Sequencer Experiment performed by NASA astronaut Kathleen Rubins.



WHAT SEQUENCING MEANS

Sequencing is a technology that could potentially address several critical space-flight needs: infectious disease diagnosis, population metagenomics, gene expression changes and accumulation of genetic mutations.

MinION™ DNA sequencer

Based on size, power and ease of use, the MinION™ DNA sequencer (Oxford Nanopore Technologies, Oxford, UK) was the most spaceflight-ready of commercially available sequencers. This device sequences DNA and RNA by measuring current changes caused by nucleic acid molecules passing through protein nanopores embedded in membranes.

MinION, is a thumb-drive sized sequencer, as the technology is built on ion pores that are on the nanometer scale, the hardware itself is exceptionally small (9.5 x 3.2 x 1.6 centimeters), light weight (less than 120 grams with USB cable), and powered only through connection to a laptop or tablet. The sequencing device is permanent, while the flow cells, to which the samples are added, are consumed after 48 hours of sequencing run-time. The flow cells that perform the sequencing are best used within 60 days, but have been successfully used on the ISS after three and a half months. The sequencer works by passing DNA strands through nanopores, and as the DNA passes through the pore, the device measures changes in current that is diagnostic of the sequence of the DNA passing through it. DNA from viruses, bacteria and a mouse are used to demonstrate that you could sequence DNA from any organism. If successful, the sequencer could be used in-flight for microbial identification as well as research into how organisms are responding to spaceflight at the molecular level, through permanent changes in DNA or transient changes in RNA production. The sequencer could also be potentially used as a life detection instrument, though it would likely requires some additional development efforts.

KEY FACTS

- The experiments were undertaken by using commercially available DNA sequencing device called MiniON on sample of mouse, virus and bacterial DNA.
- The tests were set up for selected organisms whose DNA have already been sequenced in attempt to make spaceflight conditions, primarily microgravity, the only variables that could account for differences in results.
- The technology demonstration experiments validated that the device is durable enough to withstand vibrations during launch and can operate reliably in microgravity environment.



ASTRONAUT BIOGRAPHY

Kathleen Rubins was selected by NASA in 2009. Rubins completed her first spaceflight on Expedition 48/49, where she became the first person to sequence DNA in space. She spent 115 days in space and conducted two spacewalks. She holds a Bachelor of Science in Molecular Biology from the University of California and a Ph.D. in Cancer Biology from Stanford University Medical School Biochemistry Department and Microbiology and Immunology Department. On July 7th, 2016, Dr. Rubins launched from the Baikonur Cosmodrome in Kazakhstan to the International Space Station aboard the first test flight of the new Soyuz MS spacecraft. Together the international crew of Expeditions 48 and 49 conducted or participated in more than 275 different scientific experiments including research in molecular and cellular biology, human physiology, fluid and combustion physics, Earth and space science and technology development. Dr. Rubins was the first person to sequence DNA in space, eventually sequencing over 2 billion base pairs of DNA during a series of experiments to analyze sequencing in microgravity. Dr. Rubins extent heart cells (cardiomyocytes) in cell culture, and performed quantitative, real-time PCR and microbiome experiments in orbit. Rubins has logged 115 days in space and 12 hours and 46 minutes of spacewalk time.

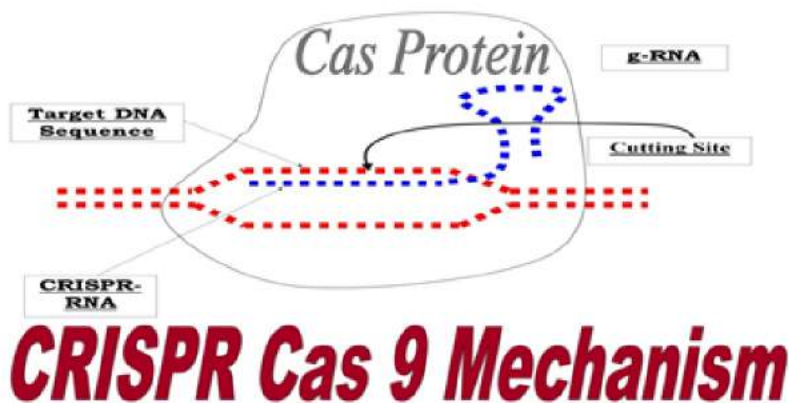
Life begins at the end of your comfort zone

CRISPR/CAS9 SYSTEM:

A NEW ERA IN BIOTECHNOLOGY

Kartik Goel and Neelesh Kapoor

COLLEGE OF BIOTECHNOLOGY, SVBPUA&T MEERUT



CRISPR/Cas9 system is a very useful tool that is used to edit any DNA sequence with a very high amount of precision and accuracy. This new technique is very effective and takes very less time in effective genome editing result because of its mechanism of action. It work as a very specific target sequence cutting machine using a very unique feature called CRISPR (Clustered Regularly Interspaced Pallindromic Repeat) RNA and form a complex with the association of Cas9 (CRISPR associated) protein and with the collaboration of both the components, they cut the DNA sequence with a high amount of specificity.

STRUCTURE

In this CRISPR/Cas9 complex there are three components, firstly CRISPR RNA, which act as a targeting member of the complex. This RNA molecule is complementary to the DNA sequence where the editing is needed to be done. Cas9 protein is a RNA guided endonuclease that is bound to CRISPR to use its complementary sequence and find the target site for its endonuclease activity. The last component of the CRISPR/Cas9 complex is g-RNA which is a self-complementary RNA whose function is to bind the Cas protein and CRISPR RNA together as into the complex.

MECHANISM

Basically, in CRISPR/Cas9 system, the CRISPR RNA (also known as Guide RNA) identifies the DNA sequence that is desired to be edited and then the Cas9 protein finally cuts the DNA molecule. After cutting the DNA sequence the solution is filled with the desired nucleotide that needs to be displaced with the terminal. After the introduction of g-RNA to this technology, it becomes very easy to edit any of the DNA sequence by just changing the CRISPR RNA and not by going through the extensively long process to redesign the enzyme for cutting every different sequence. Editing of any DNA fragment can be done even if it's not palindrome with just the changing in the sequence of CRISPR RNA in the Cas gene.

BENEFITS

This tool is just like the restriction enzymes or TALEN or ZFN but the difference between all these techniques and CRISPR/Cas9 system is, it's easy with quick results. There are many type of endonuclease like one which cuts the DNA sequence at only one strand, or both strands or maybe it just silence the gene by methylation but all are used for the different purposes so with this there is variety.

Previously, if there is a need of editing the genome the time to change even very small amount take approximately days to get the results and that too is not very accurate but this technology gives the results in hours. One more use for this technology over the other ones is that the use of it as an immune system, like it work in the bacteria, by incorporating the Cas gene into anyone genome and work as a part of the system against any virus (like HIV). Like this there are variety of places and ways to use this technology with a wide range of application. This could be used to edit the gene of interest, editing the factors influencing the gene and also by making it as a gene in ones genome and then being a part of the system.

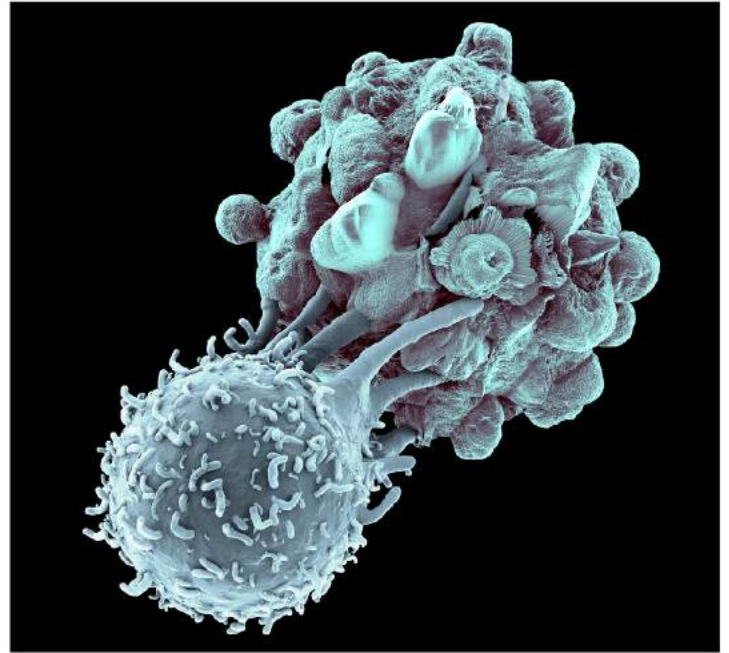
APPLICATIONS

Due to the flexibility and feasibility of this technology, it has many applications particularly in research. It could be used in genetic engineering as well as labeling any kind of gene to know its function and it's the host organism. This technology could also be used to study the cell signalling pattern by finding out the gene expression of a particular protein of plasmid. Being such a wide area of applications, make this technology one of the Nobel things.

This is a revolutionary technology, since 2012 the numbers of research article under genetic engineering have been increased exponentially and that too with the use of CRISPR/Cas9 mechanism in their research papers that is all due to the result oriented and speed up interaction of this technology. Scientists also suggested that this technology has a potential to even edit the genome of a large population. Some other applications are as follows:

IN MEDICINE:

- In 2016, scientist used CRISPR/Cas9 mechanism to cure lung cancer in human itself by editing T lymphocytes and making those to elicit the immune response against the cancerous cell and the experiment was successful.
- This technology is used to cure HIV/AIDS by editing the genome sequence or by incorporating this system into the host cell making them viral resistant.
- in 2016, this technology was used to develop a transgenic variety of pig that can be used as organ donor for humans.



IMPROVEMENT OF PLANT VARIETY:

- There is a variety of tomato that is being developed using CRISPR to increase the size of the tomato by not even altering the gene sequence; they edited the promoter by using it. Scientists were able to enhance the gene expression and gain the desirable results.
- A variety of wheat has been produced which is heat tolerant up to approximately 35 degree centigrade by modifying the heat tolerant gene that is already present there and make it suitable heat tolerant for the region of Punjab due to rise in temperature.
- Development of a Sugarcane variety that gives more yield as well as stress tolerant.

The success rate of this technology which provides the field of genetic engineering is great and it is assumed to be the solution to many problems like food, disease, energy and many more problems.

Good leaders create a vision, articulate a vision and passionately own a vision and turn it into reality.

BIONICS CLUB

Bionics Club act as a platform for students for exploring science in easy and entertaining way. The members of the Club are elected by students a President, Vice President, Secretary and Joint Secretary. The Bionics Club conducts many activities to promote science.

Science Tambola - "MAKE YOUR OWN WAY TO THE PREY"

"Every Tambola game is a matter of luck and each number that is called out changes your story, or someone else's". The Intra-Institute Science Tambola Competition was organized on 13th March 2018. An exciting and a high involvement initiative was taken, the game was tempered with a twist i.e. Science Tambola. The students from various courses participated in the event.

IMS STUDENT COLLOQUIUM

Bionics club organized IMS Student Colloquium on the 5th October with an objective to provide a platform for the students to express their views and to discuss the latest developments in the field of Biosciences. Working and non-working models were presented featured ideas on applications of Biotechnology in the Industry. More than 60 students actively participated in the event to express newer ideas orally or in the form of creative scientific models.

CATCH THE BALL

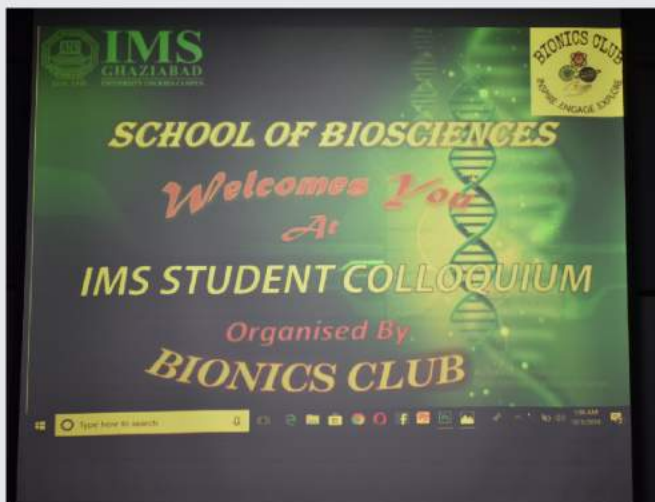
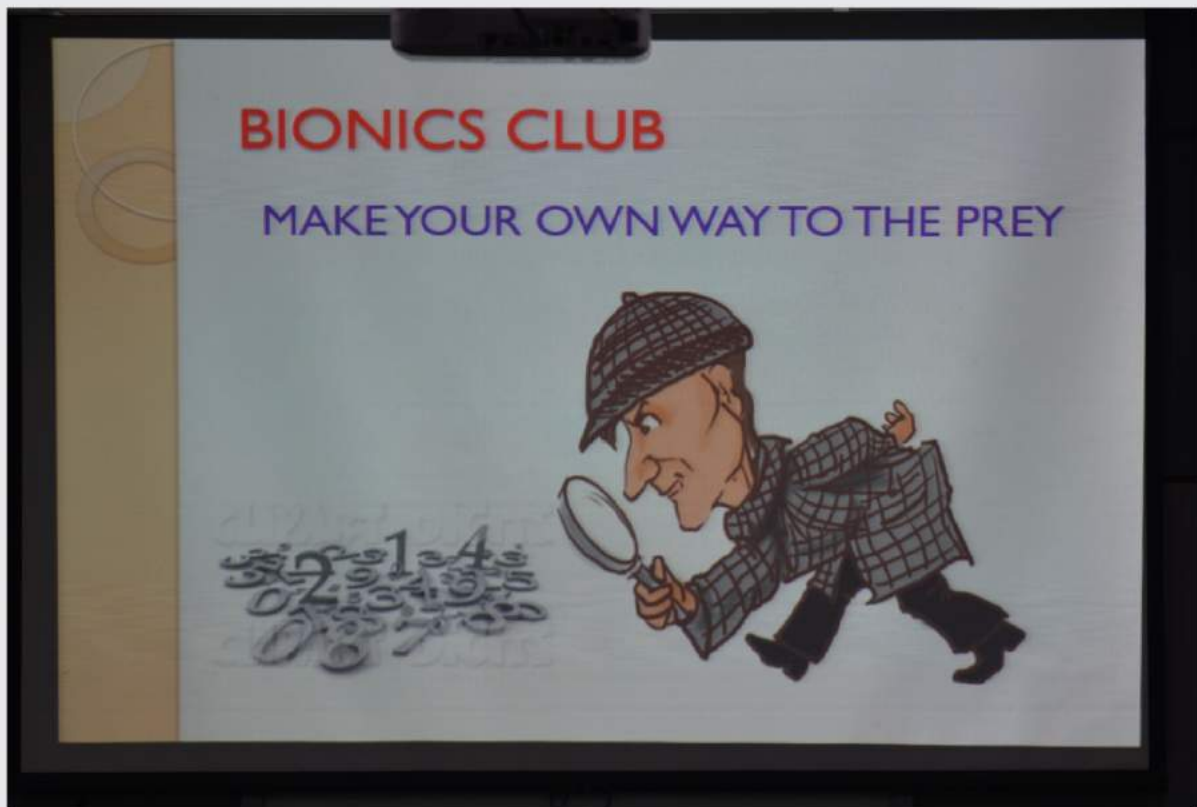
"Let the game begins with some fun & twist in a magnificent scientific way."

Bionics Club, made twiddle leisure within the games with a superficial excitement and a high involvement of future buds. There's a definite fun element in the conventional game, but this goes beyond merely finding the twisted questions and solving puzzles. The Intra-institute "Catch the Ball" event was organized on 29th August 2018. Future buds showed extraordinary skills and intelligence.

AIM TO CLAIM

"Science is the bridge between reality and miracles".

Bionics club, School of Biosciences diligently organized the event 'AIM TO CLAIM' on 13th February, 2019, having sole purpose to bring the inner talent of students to scale up their concentration, passion and dedication to accomplish their path. The students had to answer the questions from their selected topics within 45 seconds. The foremost purpose was to test the general aptitude and their knowledge of the latest happenings across various fields.



EVENTS SCHOOL OF BIOSCIENCES

NATIONAL CONFERENCE -2018

A National Conference on “Emerging Trends in Non-Communicable Diseases: Road to Prevention and Cure” was organized by the School of Biosciences on the 17th of November 2018. The objective of this conference was to discuss public health issues associated with non-communicable disease such as cancer, diabetes, cardiovascular diseases, obesity etc. and their emerging trends, pathology, mechanisms and drug development. It was a platform where students interacted distinguished scientists, scholars and students interested in research to reflect the current trends as well as future prospects in basic and applied research on NCDs. Professor Daman Saluja, Director Dr. B.R. Ambedkar Center for Biomedical Research, Delhi University was the Chief Guest, and Dr. Vishwajeet Rohil from Department of Clinical Biochemistry, Vallabhbhai Patel Chest Institute, Delhi guided students with their experience. The conference registered participants from 30 universities, institutes and colleges from the country. Posters were evaluated for relevance, content organization and clarity for first, second and third positions in research and review categories. In addition, two appreciation awards were given as an encouragement gesture.



GENESIS-2018

School of Biosciences, IMS Ghaziabad University Courses Campus organized 'Genesis-2018' an Inter-Institutional fest on 12th October, 2018, Friday.

Since 2008, Genesis has evolved into a scientific platform where young students and budding researchers from various schools and colleges of Delhi-NCR and adjoining areas join under a single roof to share as well as learn novel ideas, scientific information and innovative technologies. Dr. S.K. Garg, former Vice-Chancellor, Veterinary University Mathura graced the occasion as the Chief Guest. Dr. P. K. Srivastava, former deputy director CDRI Lucknow, also known as the 'Scientoon Man' was the Guest of Honor.

There were 5 set of science-competitions in all.

1. **INSTATHINK:** The Extempore
2. **SCIQUIZ :** The Science Quiz
3. **KNOCKDOWN :** The Oral Presentation
4. **BIOSPLASH :** A Display Of Working And Non-Working Science Models
5. **SCIENTOON:** The Science Cartoons

Genesis 2018 witnessed a huge participation from all the schools and colleges around the Delhi-NCR area. 40 schools and colleges of Ghaziabad, Meerut, and Noida attended the fest. This year over 500 students enthusiastically participated in various events.



01 **Deepak Tripathi**

B.Sc. (Hons) Biotechnology- II Year

Received Bronze Medal in 37th Official National Taekwondo Championship 2018 organized by Bengal Amateur Taekwondo Association under aegis of Taekwondo Federation of India (Lucknow) held from 08th -10th January 2018.

02

Shraddha Bharadwaj & Kajal Rana

B.Sc. (Hons) Biotechnology- II Year

Participated in Best out of Waste event in National Inter-College Festival, **Spandan'18** held at New Delhi Institute of Management, New Delhi on 8th-10th March, 2018.

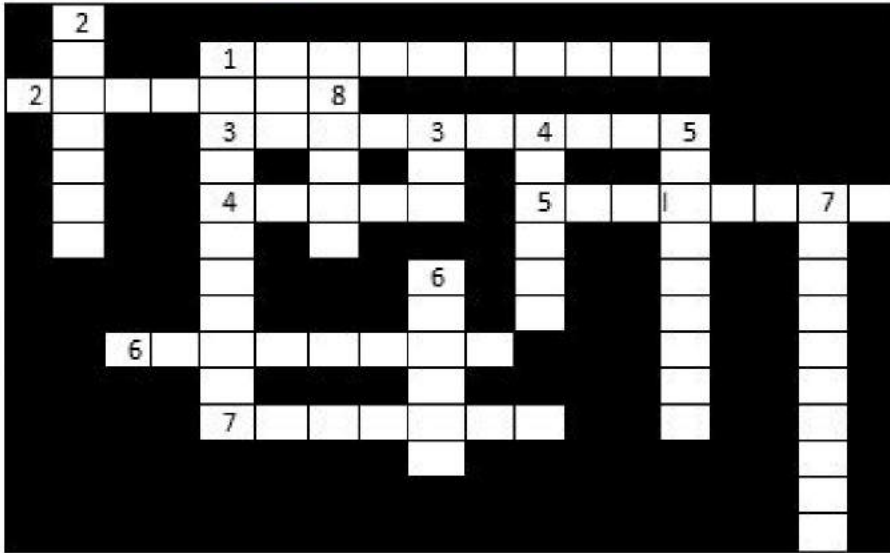
03

Simran Kaur, Archika Gupta and Archita Singh

B.Sc. (Hons) Biotechnology, Microbiology - II Year

Simran Kaur scored II position and Archika Gupta & Archika Singh received the encouragement prize on 22nd February, 2018 in poster making competition on "Clean Air for Delhi which was organized by Ministry of Environment, forest and Climate Change, Government of India.

QUIZZARD



ACROSS

- NUTRIENT FOR ALGAE
- SMALLEST BONE IN BODY
- DNA IS A CONDENSATION POLYMER FORMED FROM THESE
- A VERY SMALL UNIT OF LIVING MATTER
- ANOTHER NAME OF DROSOPHILA

DOWN

- MICROBES – ARTIST BRUSH
- PLANT WHICH CAN BE USED AS BIOFUEL
- INSTRUMENT USED FOR MEASURING BRAIN ACTIVITY
- NON STICK COOKWARES ARE COATED WITH
- PLACE OF ORIGIN OF AN EARTHQUAKE

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