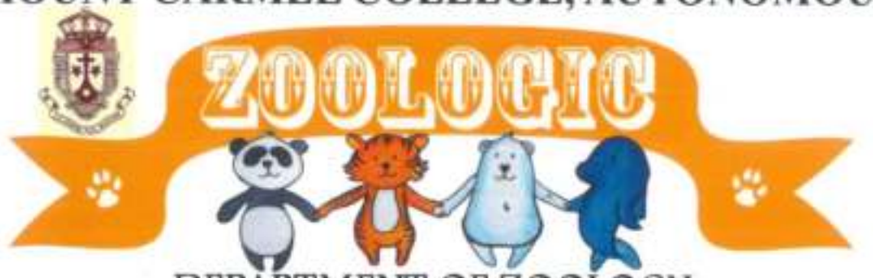
MOUNT CARMEL COLLEGE, AUTONOMOUS



DEPARTMENT OF ZOOLOGY

ZOOLOGIC 2017

Principal's message

I am happy that every year the Department of Zoology brings out their annual newsletter- containing interesting information and activities of the Department. I wish them all the best.

Dean's message

"Zoologic" is the name of the Zoology Association and the name of their newsletter. I am proud about the activities of the department and the effort they take to make studying Zoology very interesting.

This year we began the journal club with an enthusiastic bunch of students. The Department has conducted several talks by eminent speakers, attended workshops and guided student through career-counselling.

I wish them all the best and looking forward to the arrival of the newsletter every year with lots of information.

ANIMAL MIMICRY

What is mimicry?

For us human beings, to mimic is to be imitative of something/someone. We often do it for fun, to entertain our fellow *Homo sapiens* friends. Ever wondered what significance it holds in other animal species? Now this is one topic that I found interesting, it clearly speaks to me as to how nature always surprises us. Clearly, ours is a beautiful world and nature never ceases to amaze.

So, what is mimicry?

In evolutionary biology, "***mimicry*** *is a similarity of one organism, usually an animal, to another that has evolved because the resemblance is selectively favoured by the behaviour of a shared signal receiver that can respond to both.*" Mimicry may evolve between different species, or between individuals of the same species. Often, mimicry evolves to protect a species from predators, making it an anti-predator adaptation.

Mimicry is seen in various circumstances and is of various types based on the situations creatures face in this world. It's created visual similarities between unrelated animals- which can be a useful aid in this dangerous world.

This doesn't end here, there are various types of mimicry tactics that are seen in our animal kingdom, a few of which are given below.

MIMICRY: VARIOUS TYPES.

The types of mimicry differ from species to species and are also classified based on the situations of use and function. Listed below are its types:

1. COLOR MIMICRY

Color mimicry works two ways: to deceive or to advertise danger. An animal may acquire disguise to deter predators or tempt prey towards them, if present in a short range. Either way, this offers advantage as long as it allows the creature to live longer and pass on its genes of mimicry to its offspring. It definitely is a survival strategy. But not all offers deception only. For example, the highly toxic poison-arrow frog may prove deadly if attacked, but when at the verge of attack, they flash 'warning signals' to predators, such as yellow, black or dark red. If this color code is adopted by relatively less harmful animals, they could be safe from attack too.

2. THE DOUBLES

This ingenious form of mimicry targets victims rather than predators. Sample this: The African spider *Cosmophasis* preys on ants. To make it easier for it to prey, it looks like an ant itself! The ignorant victims of this species of spider accept it as one of them until it's too late. Surprisingly, this spider needs no web, it just creeps in close and pounces on its victim. But not all doubles target on preying, some use mimicry as breeding strategy. An example of this is one we've heard of since school days; yes, it's the Cuckoo bird. This clever bird, which looks just like a crow, takes its appearance to its advantage and lays her eggs in the crow's nest. This crow goes on to raise the baby cuckoo birds along with her young ones. The double mimicry tactic is also used for bait.

3. SHOCK TACTICS

Some animals have developed a style of mimicry that is more inclined to giving shocks or inducing fear. The South American false-eyed frog responds to attack by inflating it's body until the minute spots turn into large eyes that make the predators think twice before attacking them. While the predators are put into a trance, the frog escapes. Some caterpillars show similar attacking styles. The Hawkmoth larva raises its body until it looks like a snake, causing the predators to back off and run for their lives.

4. BLUFFING

While warning colors are a thing associated with dangerous animals, it works for vulnerable creatures as well. The hoverflies that sip nectar from flowers flaunt the yellow and black striped uniform of stinging wasps. This is enough to discourage birds from preying them as they'd rather never prey on a wasp. Now this is a rather interesting example; some orchids mimic insects to attract and dust them with pollen. Having realized that they've failed to find a partner, these insects fly to other orchid, unknowingly fertilizing them. Another interesting phenomenon is seen in fireflies. Female fireflies attract males using coded flashing light signals. Each species has its own code, but some female fireflies mimic the code of other species, lure males and eat them up.

5. WARNING STRIPES

Yellow and black stripes translate to stings, poison and pain, not only for insect eating animals but also to many species, including us humans. Once stung by an insect with such stripes, other insects that have similar stripes are avoided as well. Example, a hoverfly. Humans are often misled by warning stripes of harmless hoverflies and assume the fact that they sting, which is not true. Another effective example is the Cuckoo bee. It mimics the buff-tailed bumblebee and invades a nest without being recognized by the worker bee. Once inside, it kills the queen and lays her eggs. These young cuckoo bees are raised by the worker bees, unaware that they've been fooled. Generally animals with unpleasant experiences with such insects avoid preying on other harmless insects with the similar stripes.

Some forms of mimicry arise from natural selection, the most popular example being the peppered moth and the soot colored moth during the beginning of industrialization. Hence, mimicry is definitely one among the many beautiful phenomena that is witnessed in nature. It's one of the most interesting studies under animal behaviour. What a beautiful world, indeed!

Pooja Ayachit
2nd BSc CBZ

Heavy chocolate consumption may be linked to heart health

High levels of chocolate consumption might be associated with a one third reduction in the risk of developing heart disease.

The findings confirm results of existing studies that generally agree on a potential beneficial link between chocolate consumption and heart health. However, the authors stress that further studies are needed to test whether chocolate actually causes this reduction or if it can be explained by some other unmeasured (confounding) factor.

The World Health Organization predicts that by 2030, nearly 23.6 million people will die from heart disease. However, lifestyle and diet are key factors in preventing heart disease, says the paper.

A number of recent studies have shown that eating chocolate has a positive influence on human health due to its antioxidant and anti-inflammatory properties. This includes reducing blood pressure and improving insulin sensitivity (a stage in the development of diabetes).

However, the evidence about how eating chocolate affects your heart still remains unclear. So, Dr.Oscar Franco and

colleagues from the University of Cambridge carried out a large scale review of the existing evidence to evaluate the effects of eating chocolate on cardiovascular events like heart attack and stroke.

They analyzed the results of seven studies, involving over 100,000 participants with and without existing heart disease. For each study, they compared the group with the highest chocolate consumption against the group with the lowest consumption. Differences in study design and quality were also taken into account to minimize bias.

Five studies reported a beneficial link between higher levels of chocolate consumption and the risk of cardiovascular events. They found that the "highest levels of chocolate consumption were associated with a 37% reduction in cardiovascular disease and a 29% reduction in stroke compared with lowest levels." No significant reduction was found in relation to heart failure.

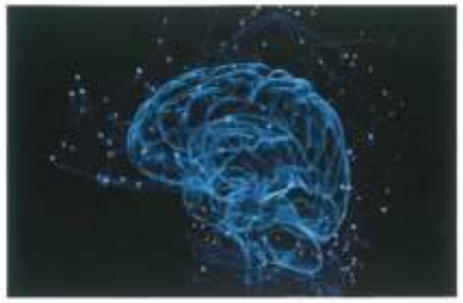
The studies did not differentiate between dark or milk chocolate and included consumption of chocolate bars, drinks, biscuits and desserts.

The authors say the findings need to be interpreted with caution, in particular because commercially available chocolate is very calorific (around 500 calories for every 100 grams) and eating too much of it could lead to weight gain, risk of diabetes and heart disease.

However, they conclude that given the health benefits of eating chocolate, initiatives to reduce the current fat and sugar content in most chocolate products should be explored.

- K Deepa Shalini
2nd BSc BtCZ

Your Brain Connections Are As Unique As Your Fingerprint



The pattern of connections between the billions of neurons that exist inside the human brain are completely unique to each person, new research reveals. By developing a new technique to image these connections in greater detail than ever before, scientists have managed to identify people with 100 percent accuracy just by looking at their neural fingerprints. The idea that each person has a unique set of brain connections – or connectome – is nothing new. After all, no two individuals have the same personalities or thought patterns, so it seems logical to assume that our brains are all uniquely wired.

However, because of the unimaginable complexity of the human brain, creating a map of a person's connectome remains beyond the reach of scientists. Until now, our best efforts had managed to reveal the connections between different brain regions, without showing the links between individual neurons.

A team of scientists therefore decided to use an imaging technique called diffusion MRI to generate a map of local connectomes in 699 human brains. This means that rather than looking at the whole brain and trying to work out how different regions are wired up, they focused in on small sections of white matter and mapped out the individual connections between the neurons populating these sections.

The study authors explain how this approach allowed them to reveal the highly unique local connectome of each brain. To test the reliability of their findings, they conducted 17,398 identification tests, during which they were able to distinguish which connectome belonged to which brain every time.

"This confirms something that we've always assumed in neuroscience – that connectivity patterns in your brain are unique to you," said study co-author Timothy Verstynen in a statement.

While a person's connectome is partly determined by genetics, the fact that identical twins were found to share only 12 percent of their connectivity patterns indicates that the vast majority of this fingerprint is shaped by life experiences and education. In fact, the researchers found that every person's local connectome is constantly in flux, changing by an average of 13 percent every three months.

"This means that many of your life experiences are somehow reflected in the connectivity of your brain. Thus we can start to look at how shared experiences, for example poverty or people who have the same pathological disease, are reflected in your brain connections, opening the door for potential new medical biomarkers for certain health concerns," concludes Verstynen.

- K Deepa Shalini
2nd BSc BtCZ

DID YOU KNOW?

- Did you know that bacteria can communicate through NANOTUBES!! They can even exchange small molecules, proteins as well as some genetic materials!!
- The most primitive form of aerobic bacteria appeared on our planet 2.48 billion years ago!!
- Kangaroos barely release any METHANE. Scientists are trying to harvest the bacteria found in the colons so that they can transfer the "SKILL" to cows to greenhouse gas emission!
- Human breast milk contains SUGARS intended to feed intestinal bacteria, rather than the infant itself1
- Store bought MAYONNAISE, which is blamed for food poisoning, actually inhibits the growth of bacteria. Food poisoning on a picnic is almost caused by some other ingredient like chicken!
- *Magnetospirillium mangneticum* is a free living bacteria which has the ability to actively take IRON, convert it to MAGNETIC MAGNETITE, align it like a backbone along its body and travel using magnetic fields!
- Drying your hands with paper towel will reduce the bacterial count by 45-60% on your hands whereas using a HAND DRYER will increase the bacterial count on your hands by 255% because it blows out bacteria already living in the warm environment!
- Did you know that some civil war soldiers had WOUNDS that GLOWED in dark because of BIOLUMINESCENT BACTERIA that was PUKED by NEMATODES!

- HONEY is a natural reservoir for Botulinum bacteria .Adults can normally process it whereas infants cannot, so honey should not be given to babies!
- To prove that STOMACH ULCERS were caused by bacteria and not by stress, a scientist drank a beaker full of bacteria, he did develop stomach ulcers and won the Nobel Prize for proving it!
- Did you know that 1 teaspoon of bacteria- Clostridium botulinum, if distributed properly, could kill every single human in the USA!!
- The white bad smelling chunks that you find in your mouth are not bits of food, but HARDENED SWEAT and BACTERIA from the TONSILS!!
- HUMAN BITES are the most dangerous animal bites in the world due to the bacteria in our mouths!!

- **Sheetal V Rao**
3rd BSc CZM

A crawl with the "White-ants"

The world of insects is much pondered upon, for they see the world in a completely different angle altogether. Since school, we have been hearing about some of these creatures to be living in colonies like bees, ants and termites. Although we are familiar with the termites which destroy our elegant wooden furniture, not many of us know of the ones which build and thrive in massive majestic mounds. Fortunately, last vacations, I got the opportunity to work with a PhD student working on these fascinating little creatures. Here are some of the things I learnt-

Termites are called white-ants. That's because they look like ants with modified mandibles and their abdomen is actually whitish in color. But they are more closely related to the cockroaches than ants. They are basically specialized cockroaches which feed on wood and fungus or soil organic matter. (We worked on *Odontotermes obesus*)

Since they live in colonies, it is obvious that they'll have a queen. But it isn't like the bees who have ONLY a queen. Here, they have a king too. And this couple have no other deed but to produce more of their kind. Also, they have chambers for secondary queens! Just like actual human kings have had. The alates (winged fertile ones) find a place to settle with their mate to build a new colony. Once they start mating, they don't ever go out of their nest. The queen's abdomen enlarges so much due to the continuous production of eggs, that she becomes the largest of her kind in the colony. She can't move or feed herself, hence the workers do all the formalities.

They are agriculturists too! There are certain species of termites which grow fungus inside their mounds. Fungus grown on their feces. They eat the fungus fruiting bodies.

Guess what's next? They have caste system! Oh yes, that's right. They are of 4 castes generally. First caste is the royal - the king and the queen. Then come the major workers and minor workers. These are sterile and they are the ones who build the mound and do agriculture, etc. Last are the soldiers which protect the mound from predators and die to save the royals.

The life cycle of a termite begins with an egg, but is different from that of a bee or ant, in that it goes through a developmental process called incomplete metamorphosis, with egg, nymph and adult stages. Nymphs resemble small adults, and go through a series of moults as they grow. Pheromones regulate the caste system in termite colonies, preventing all but a very few of the termites from becoming fertile queens. Most termites are blind, so communication primarily occurs through chemical, mechanical and pheromonal cues. Workers use several different strategies to deal with their dead, including burying, cannibalism, and avoiding a corpse altogether.

The most fascinating part is the different kinds of mounds found in different places. The sculptured mounds sometimes have elaborate and distinctive forms, such as those of the compass termite (*Amitermes meridionalis* and *A. laurensis*), which builds tall, wedge-shaped mounds with the long axis oriented approximately north–south, which gives them their common name. This orientation has been experimentally shown to assist thermoregulation. The north-south orientation causes the internal temperature of a mound to increase rapidly during the morning while avoiding overheating from the midday sun. The temperature then remains at a plateau for the rest of the day until the evening. Tree-piping termites (*Coptotermes acinaciformis*) construct mounds at the base of trees, particularly eucalyptus. The termites enter a tree from below ground level and, with the help of soldiers which produce wood-solvent chemicals, create hollow pipes through the trunk and branches, filling the gaps with soil. The tree is weakened but not killed. Amazing isn't it?

Various research is going on, on the architectural aspects of the termitaria to learn about the way they keep it intact even during extreme weathers and how the conditions are maintained inside the mound. (Research shows that the pH, temperature, gaseous concentration and humidity is maintained at all times inside the termitaria)

- **Aditi Vijayan**
1st BSc, CBZ

THE ORIGIN OF LIFE

Forces of gravity pulled rocks and dust together
Forming an orb which circled the ball of fire
It Looked more like hell than what one would desire,
Comprising nitrogen, fire and vapors,
It was nothing more than a fiery sphere of lava.
Until a smaller planet hit, causing it to shatter,
Gravity worked its magic again
And there began a new chapter,
It was all the more chilled down
Thousands of meteors hit, made it frown,
Salt dissolved and in water it drowned,
Islands emerged;
Meteors struck again, bringing amino acids from outer space
Chemicals got collected in the ocean ,
Molecules came closer and underwent aggregation.
Life began and so did a new journey,
Soon formed the earth as we know it already.

- **Riya Kothari**
1st BSc, CBZ

Concrete Jungles

Cities are growing bigger and becoming numerous. At present, 2% of the world's land is occupied by its cities, utilising 75% of the world's natural resources. This is because more than half of all people live in an urban area. By 2030, 6 out of 10 people will live in a city and by 2050, 7 out 10.

In such a time, it seems like biodiversity loss will be inevitable as habitat degradation goes hand in hand with the growth of cities. Yet, recent discoveries of new urban species across the globe, has challenged this idea.

Three new species of millipedes were discovered in Launceston, Tasmania; 30 novel species of flies in Los Angeles in March, 2015; a never-before-heard leopard frog in New York City (2014) – the first amphibian to be recorded from the region in 150 years - and 4 previously unknown species of bees from New York City in 2012.

Another addition to this list, is the new land snail *Adelopoma paulistanum*, discovered in the woodlands of the 108 square meter Park Burle Marx in São Paulo. São Paulo is the largest city in the southern hemisphere, the third largest in the world.

This resident of São Paulo ("Paulistanos") is a diplomat and one of eight known neo-tropical species discovered in its genus. Having a shell of 2.8mm, it is the largest of its genus described so far, with other members rarely reaching 2mm.

It has a shell composed of 6 whorls. The shells of the newly hatched, young snails called the protoconch is composed of 1.5 whorls, instead of the usually seen 2. Adult snails have 16 axial ridges called threads on the topmost whorl as opposed to the generally seen 20.

Its sinistral shell and a pair of filiform tentacles, arising posterior out of the head are characteristic of the family Diplommatinidae. The tentacles bear two eyes at their respective ends. The eyes having two lobes, thus giving this family its name – *diplós* =double, *ommatos* = eye.

Adelopoma paulistanum members have shells coloured anywhere from pure white to pale beige. This range of colour appears to be special to this species as all other species members have shells that are white.

The Burle Marx Park is composed of remnants of the Mata Atlântica or native Atlantic rainforest. Naturalists have hypothesized that this snail was once widespread. With the rise of buildings and depletion of its natural habitat, its distribution became restricted to this one park in São Paulo, a highly endangered habitat.

This, coupled with the fact that it possesses high sensitivity to drying, dying fast when exposed to light, initiating careful conservation measures becomes all the more important. With more than 86% of the Earth's species still unknown, who knows where we might find the next new and intriguing animal. For all you know, he may just be lurking in your backyard.

- Amruthavalli V V
1st BSc CBZ

Can Space Travel Cause Blindness?

Space travel poses a lot of problems, several of which, are associated with the human body. Some of these include muscle atrophy, deterioration of the skeleton, cardiovascular system functions, and as per a recent study conducted by researchers at the University of Miami, visual impairment. It was found that, astronauts who spent approximately 6 months or more in space, had a high-volume of cerebral fluid as compared to those who spent a shorter time in space. Functions of the cerebral spinal fluid include that of protecting the brain and the spinal cord, delivering nutrients to the nervous system tissue and removal of waste products from the brain. The cerebral fluid usually adjusts to the pressures on Earth but it gets discombobulated by microgravity on space and it gets accumulated near the eye socket and certain cavities of the brain. The added pressure of the fluid could flatten out the back of the eyeballs and thus can cause change in the shape of the retina, inflammation of the optic nerve and the formation of choroidal folds, which are wrinkles inside their eyeballs. This condition is known as Visual Impairment Intracranial Pressure Syndrome.

In 2005, Astronaut John Phillips spent 6 months at the ISS, during which his vision went from 20/20 to 20/100. In 2009, after spending 6 months aboard the ISS, Astronaut Robert Thirsk faced a similar situation. Though gradual improvements were seen in both, their vision was not restored to its original state. Since his return to Earth in 2015, Astronaut Scott Kelly must rely on his reading glasses.

It is not for certain that the accumulation of cerebral spinal fluid is the cause for vision impairment, because the only way to measure the pressure of the fluid accurately is by drilling a hole in the skull of the astronaut or by performing a spinal tap in space. It has also not been explained why only 20% of the astronauts who go for long space missions are affected.

Various causes regarding this issue were proposed, some of which included deficiencies of vitamin and folate, and the theory that **Polycystic Ovarian Syndrome** could cause vision loss. But vision impairment was seen mostly in men. 20% of the women who had vision impairment did not suffer from PCOS, but they did have hormonal imbalances which is the underlying cause of the cyst. Scientists at the Johnson Space Centre noticed that like women with PCOS, astronauts with vision impairment had high levels of the amino acid Homocysteine in their blood. According to a study, it was revealed that there is a lot in common between the astronauts and the women suffering from PCOS such as thicker retinal fiber layers and similar genetic traits. It is believed that further study in PCOS could explain why some male astronauts return to Earth with vision damage. This is an issue that scientists at NASA take very seriously.

As for some space enthusiasts like me, we would risk it anyway.

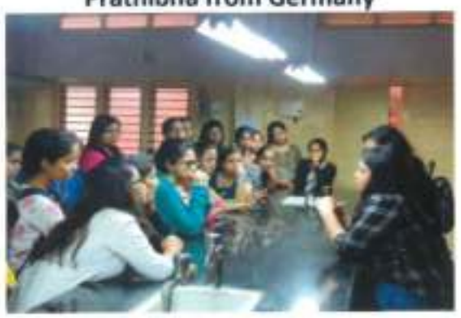
- Yaashna .S. Makhija
1st BSc CBZ

Activities of the department

-Eye testing camp- Vision Express

-Career counselling talk by Dr. Shashikant - Life Gene.

-Alumnae interaction- Chitali and Prathibha from Germany



-Exhibition on insects – Prof. Dr. Sannaveerappanavar's private collection

-INSPIRE - PROGRAM

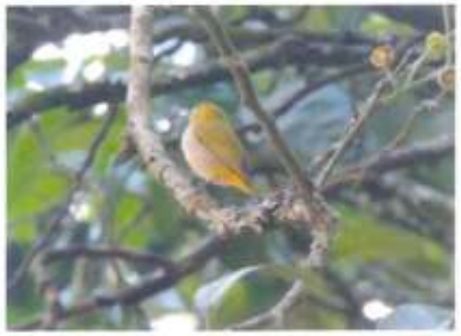
-Anemia screening

- ORNITHOLOGY

(Bird watching at Jakkur Lake)

Indian Blue robin

Asian Paradise flycatcher



Oriental white eye

Leaf warbler

White browed bulbul

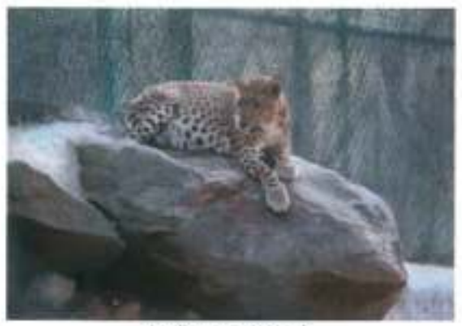
Tickell's blue flycatcher

Indian tree frog

Pied Kingfisher

Royal Bengal Tiger

Crocodile basking in the sun



Indian Leopard

Green bee-eater

White-Backed vulture

Greater cormorant

Crested Serpent eagle

By: Sudhanvi. S, III BSc CBZ.

Why do cats have vertical pupils?

The sharpest image is produced by round pupils, and if cats weren't nocturnal, they probably would have round pupils like us. But the vertical pupil, in combination with horizontal eyelids, gives the cat greater and more accurate control in different types of lighting. A cat may adjust the amount of light by moving eyelids only.

Brahminy kite

Mallard duck

- Vasudha Bhide
III BSc CBZ

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