BIOME

The BIOlogy Education MEssenger

(An ATBS eNewsletter)

CONTENTS OF THIS ISSUE:

From The Editorial Team.....

Greetings to all you from the editorial team of Biome – the ATBS eNewsletter! We are here with the fifth issue of this eNewsletter. For those of you who are not familiar with ATBS, the abbreviation stands for Association of Teachers in Biological Sciences. The idea of an eNewsletter was initiated as an attempt to provide a platform for biology teachers/educators to share thoughts and ideas with the fellow teacher community so as to make biology teaching in the classroom interesting. We have come out with four issues so far which one can find on the website www.atbs.in. This is the fifth issue of Biome and since we are in the month of November, we thought of making this issue student friendly in view of children's day that is observed in this month. However, we believe that a person interested in biology can remain a child at heart by keeping one's curiosity alive throughout one's life.

We hope you will read our past issues as well and also recommend other biology teaches to read the same. This issue includes an article on the extinction of parakeets written by Prof. B. B. Nath. This is the second such article in the series of such pieces on extinction of animals. With this series we hope to make readers aware and to sensitize them to the effects of many of the anthropogenic activities which lead to such extinctions. We also have a fun activity with petal pigments which one could try! Snippets of activities by the ATBS and the Biology Olympiad Programme can be found interspersed in the issue. Also included are some interesting facts from the animal kingdom as well as on how one can use easily available animals to make observations in animal behavior.

Hope you enjoy reading and sharing what this issue has!! Also, wishing all students and those with a child's heart and mind a very happy Children's Day!!

Bimalendu B. Nath,
Department of Zoology,
Savitribai Phule Pune University

Rekha Vartak,
HBCSE, TIFR,
Mumbai

Anupama Ronad,
HBCSE, TIFR,
Mumbai

Observations in animal behavior using the Siamese fighting fish

Anupama Ronad is a part of the Biology Olympiad Cell at Homi Bhabha Centre for Science Education (HBCSE), TIFR. She is involved with the Biology Olympiad Programme as well as the NIUS Programme since the past several years.

The study of animal behavior, termed ethology is a very interesting area in biology especially for students and researchers who have a naturalistic streak. However, this area of biology is not included in regular high school or even at the undergraduate level and hence students as well as many teachers are not exposed to the fundamentals of this area of research. Study of the behavior of animals can be done in the field, out in the wild or to some extent even in the lab as well as within the confines of one's home without the use of any sophisticated instruments or equipments. One such animal / organism that can be easily used for studying animal behavior is a fish belonging to the genus Betta.

Those of you who are aquarium owners and maintain colourful fishes at home as a hobby must have paid regular visits to shops which supply such fish and other accessories required for to pursue this hobby. If you look around the various aquariums in such a shop you would have noticed that there are some coloured fishes generally red or blue in colour kept in isolation either as a single fish in single containers or one fish each tied in a small packet filled with water. It might seem as though these fish have been punished for being mischievous. These are in reality the 'Siamese fighting fish' and their scientific name is *Betta splendens*. They belong to the genus Betta and are known to exhibit aggressive behavior. They have been

The BIOLOGY OLYMPIAD PROGRAMME:

Stage 1: NSEB (National Standard Examination in Biology)

Stage 2: INBO (Indian National Biology Olympiad)

Stage 3: OCSC (Orientation cum Selection Camp)

Indian team of 4 students selected at the end of the OCSC!

Team undergoes training at HBCSE, Mumbai prior to departure!

reported to attack other fish in their close vicinity and in worst cases cause severe injury and even death of the victim.

This fish can easily be purchased at such shops and used to observe various kinds of behavior in them. All that one needs is a small aquarium filled with clean water and fish food to keep the fish alive and healthy during the course of experimentation. One can then design experiments to test certain hypothesis that one makes. For example, in our lab, we wanted to test if a fighter fish recognizes itself and whether it responds in a neutral manner or whether it displays any kind of behavior when it sees itself. To test this, we got a mirror of a size that would fit the inside of a small aquarium that housed the fish. Interestingly, when shown the mirror, the fish looked at an image of itself as a different individual and exhibited behaviors and displays related to aggression towards the image. Some of the behaviors that we observed were:

i. Beating of the pectoral fins
ii. Rapid zigzag movement of the body and the caudal fin
iii. Pecking at the base of the aquarium
iv. Erection of dorsal, anal and caudal fin – exhibition of erect fins is an attempt of the fish to display its size and strength
v. Operculum display (opening of the operculum) – the fish extends its gill covers and faces the opponent directly to display anger.
vi. Lateral display - is a behavior where the fish exhibits the lateral surface of its body, expands its dorsal and caudal fins and vibrates/quivers its body.
vii. Gasping for air

Before carrying out such experiments it is essential to observe the behavior of the animal under normal control environment. Thus some of the behaviors listed above were normal behaviors which showed no change during the course of the experiment while some were exhibited in response to the introduction of the mirrors. While performing behavior experiments it might be helpful to video record the behavior without hindering the experiment so that one can watch the recording and note down accurate results.

Thus, such experiments can be interesting to perform. One can be very creative while designing controls and error-free experimental designs. Additionally handling such model animals while doing hands-on biology can be very satisfying and fun!

--------- Anupama Ronad

TEAM INDIA – IBO 2017

From Left to right: Dr. Ranjitsingh Devkar, Dr. P. G. Kale, Stuti Khandwala (student) , Vidushi Varshney (student), Archit Gupta (student), Alex Tharakan (student), Dr. Kiran Kondabagil, Ms. Anupama Ronad.

INTERNATIONAL BIOLOGY OLYMPIAD (IBO) 2017 AT A GLANCE!

- Venue: Coventry, United Kingdom
- Dates: 23rd to 30th July, 2017
- No. of participating countries: 63
- No. of student participants: 241
- Medal tally of Team India:

  3 Silver & 1 Bronze medal!!

LADY JANE AND INCAS: THE FORGOTTEN COUPLE OF A LOST SPECIES OF PARAKEET

Bimalendu B. Nath
Department of Zoology, Savitribai Phule Pune University, Pune-411007
bbnath@gmail.com

Prof. Bimalendu B. Nath is the former Head and a Professor at the Department of Zoology, Savitribai Phule Pune University. He is a passionate teacher and is actively involved in teaching as well as research for over three decades.

In the twentieth century, many species have vanished forever and among them, Carolina parakeet (*Conuropsis carolinensis* Linnaeus 1758) has a different story altogether which taught a lesson for all conservationists, animal lovers and policy makers. The extinction episode revealed that mere human interference may not trigger a total extinction of a species, there could be other compelling ecological factors too which can directly and indirectly lead to extinction.

The Carolina Parakeet was a small parrot. The feathers were mostly green with yellow shades near edges. The head was bright yellow with an orange forehead. The reddish plumage near the beak gave an attractive look not so common amongst the native birds. The Carolina parakeet lived throughout the eastern America. In the 16th and 17th century, the bird lived in huge numbers, perhaps a few millions of parakeets used to flock over the forests and swamps. By the turn of the 18th century, the population began to decline and was hardly noticed outside

Activities conducted by ATBS during 2016 - 2017!!

- The 11th Annual National Conference on 'Wetlands for Disaster Risk Reduction' was held on 2nd February, 2017 at K. M. E. Society's G. M. Momin Women's College, Bhiwandi, Maharashtra.
- A Resource Generation Camp (RGC) for generating a question bank for the first stage Olympiad examination, National Standard Examination in Biology (NSEB) was held from 23rd till 25th June, 2017 at HBCSE, Mumbai.

Florida. According to one record, the last known wild parakeet was killed in 1904, while another eyewitness documented the death of a female parakeet shot dead near Orlando, Florida on 4th December, 1913.

The population of Carolina parakeet reduced from millions to just a few individuals by the end of the 19th century. The last two parakeets 'Lady Jane' and 'Incas' were kept and looked after in the Cincinnati Zoo. The two birds were a popular couple for the visitors and they lived together as cage mates for thirty two years. Lady Jane died in 1917 leaving behind Incas, the only representative of the Carolina parakeet species. Parakeets are monogamous and they remain loyal to the mate for life. Incas died in 1918 and the zookeepers commented that Incas died of grief, mourning his dead wife. Thereafter, the body of Incas was frozen in ice and arrangements were made for its transportation to Smithsonian Institution in Washington for preservation. But the body of Incas disappeared on the way. No one knows till date what had happened and probably it was stolen. This is still an unsolved mystery.

All evidences indicated human hand in the extinction of the Carolina parakeets. However, combination of factors eliminated this species from its habitats, although there were quite a few ecological features mediated directly by humans. If we analyze the sequence of events leading to its extinction, the primary cause happened to be the massive deforestation in the 18th and 19th centuries. In order to generate space for agricultural land, forests were rampantly destroyed and the loss of natural habitat triggered the initial phase of decline of the Carolina parakeet.

During the pre-colonial days, when forests were converted into fruit orchards and agricultural field of grains, the parakeets changed their food habits. They developed a liking for apples, pear seed, corns and started damaging the crops before they could ripen. The livelihood of farmers was threatened and Carolina parakeets were declared as pests. Eventually, the farmers started shooting the parakeets whenever they were in sight. Additionally, social behavior of parakeets also contributed to their extinction. If any of their members were injured or killed, the other birds of the flock would assemble near the wounded ones, making the job of the hunters easy for shooting as many birds as they wished to kill. Wholesale slaughter of parakeets encouraged trading of colorful feathers which became popular as fashionable decorations for women's hats. Moreover,

Activities conducted by ATBS during 2016 - 2017!!

- Winners of the State level essay competition for students of Class VIII – XII held in November 2016 were:
- 1st Prize: Bhuskute Shruti Shekhar from Dr. Babsaheb Ambedkar College, Mahad, Raigad.
- 2nd Prize: Dipashree Naresh Chaudhary from VPM College, Mulund (E), Mumbai.
- 3rd Prize: Varun Rajendra Chavan from Sir Parshurambhau College, Tilak Road, Pune.

many parakeets were captured by trappers who sold them as caged pets all over the world.

An ecological factor contributed to the parakeet's final phase of extinction which can be best described as inter-specific competition, popularly known as 'Gause's principle of competitive exclusion'. Carolina parakeets always roosted together in large hollow trees. When European honeybees were introduced in America for facilitating crop pollination, the Carolina parakeets faced severe competition. The exotic honeybees began to occupy the hollow trees like cypress and sycamore and expelled Carolina parakeets from their usual roosting and nesting sites. Gradually, the entire species disappeared by the turn of the 19th century.

As someone once tweeted, 'Carolina parakeet gone but not forgotten', let us hope history will not be repeated for other members of the parrot species which we still see around us and we do not lose them in the near future.

******

Do you know??

Here are a few questions about some animals which have certain special features which make them interesting!!

Q1. Which is the heaviest flying bird?

Q2. Which animal is known as the 'river horse'?

Q3. Which animal can consume food containing cyanide, an extremely poisonous chemical, without any side-effects?

-----Developed by Prof. B. B. Nath

(To know more about these animals, go to page number 10 & 11)

Biology can be fun……..

Flowers with bright and beautiful colours can make any landscape very appealing to the eye. The colour of a given flower is due to various pigments present in the petals. If you observe the flowers closely you may see that some flowers which are bright pink in colour look pale violet when they are about to wither away. Images showing this phenomenon are given below. Have you ever wondered why this is so……

There is an activity on the next page that can throw some light on this change.

Pigments in flowers!!

Anthocyanins give flowers their pink, purple, violet or blue colours.

On the other hand, flavanols such as gossypetin are pigments present in chromoplasts that give yellow or orange colour to flowers!

They generally act as attractants for pollinators such as insects!

Requirements:

- Test tubes
- Methanol
- Acid
- NaOH
- HCl

Activity: Effect of pH on pigments.

Plants contain different types of pigments such as chlorophylls, water soluble flavanoids and fat soluble carotenoids. Flavanoids include anthocyanins (red/ scarlet /violet) and flavanols (yellow). Some plant species contain a different type of flavanoid such as betacyanins.

Anthocyanins render pink/red/violet/blue colours to petals depending on the pH of the cell contents.

(i) Cut the petals of pink/red/blue coloured flowers into small pieces and place them in separate test tubes.

(ii) Add 2 ml. of acidified methanol (1ml HCl in 99ml methanol) to each test tube and shake well. Observe for any colour change after this addition.

(iii) Remove a few drops of the supernatant in another test tube and add a few drops of 1% NaOH solution. Note down the observations in the table below. Observe what happens now.

(iv) Now add a a few drops of 1% HCl to the same test tube and observe what happens.

The results of this activity would have made you realize that anthocyanins are pigments that actually behave like indicators. They are pink in acidic conditions and violet in alkaline conditions. Thus when flowers are fresh the pigments give a pink colour to the flowers. However, in senescing petals when the cell environment becomes alkaline, the anthocyanins turn violet in colour!

---------- *From the Biology Olympiad Cell*

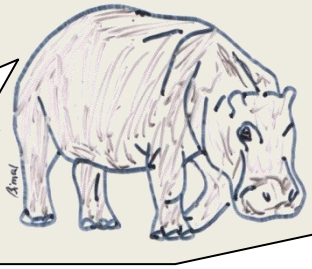
Answers and more to 'Do you know?' ……
(To the questions on page 7)

Q1. It's me the 'African Kori Bustard'. I am the heaviest bird (maximally weighing 19 kg) that can fly. However, most of the time I stay on ground and fly only to escape from the predator.

But, what limits the size of a bird?

It has been shown that the molting rate of feathers limits the size. Among the extant flying birds, swans weighing upto18 kg are the heaviest birds.
Although extinct, Argentavis of the Miocene Epoch in Argentina is estimated to have weighed as much as 70 kg, it is most probably due to the ability of this giant bird to molt all its feathers simultaneously during a long fast, fueled by accumulated fat deposits.

Q2. In Greek, 'hippos' means 'horse' and 'potamos' means 'river'. I, the Hippopotamus am the third largest land animal after the elephant and the rhino. We hippos generally prefer to stay in water throughout the day and come out at night to consume grass on the nearby banks like a 'horse'.



Here is something interesting about us!!

Since ages, man thought that hippopotamuses sweat blood as their skin secretions are red in colour. Later, scientists found that their skin lacks typical sweat glands but secretes a red coloured fluid made up of pigments. When exposed on skin, this pigment polymerises and changes to brown color and acts as anexcellent sun-screen. The secretion is also found to have antibacterial action. Thus this substance is the Hippo's ingeneous survival tool.

Q3. We, the Golden bamboo lemurs are endemic to the rainforests of south-eastern Madagascar and feed on giant bamboo species *Cathariostachys madagascariensis* which contain approximately 15 mg of cyanide per 100 gm of fresh weight of shoot. We eat an average of 500 gm of this bamboo every day which is lethal for other animals including you!

How do think this can be explained??

Bamboo shoots and leaves are known to contain cyanogenic glycosides which can get converted in the gut to form HCN. Feeding exclusively on these plants invariably places the herbivore in great danger of cyanide poisoning. The survival of these lemurs is an evolutionary novelty which is most probably a result of upregulated detoxification pathway. This is an excellent example of co-evolutionary arms race in which the focus of selection on the plant is to escape the predation and the focus of selection on the predator is to overcome those escape strategies or defenses.

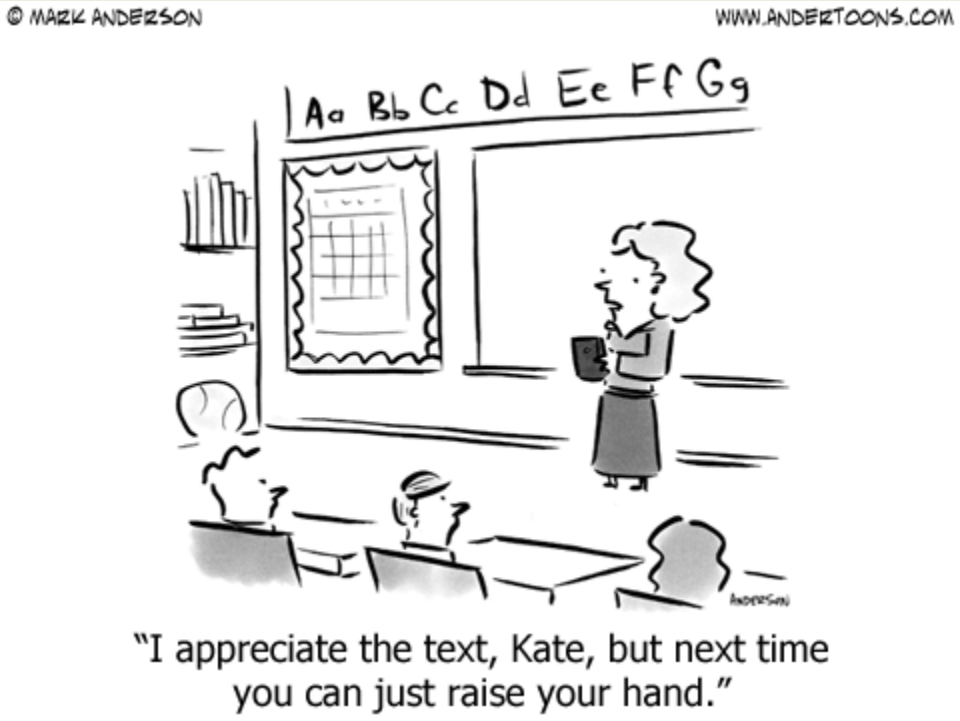
NATIONAL COMPETITION FOR INNOVATIVE BIOLOGY EXPERIMENTS (NCIBE)

The Association of Teachers in Biological Sciences has launched a national level competition for innovative biology experiments. The competition will be held every year and is open to any person who is above 18 years of age and is enthusiastic to design and work on such experiments. The proposed experimental design should reflect novelty and innovative approach. Also, the experiments to be submitted for the competition should be easily doable in a regular undergraduate lab. Hence, use of sophisticated and expensive instruments should be avoided.

The timeline, guidelines and details regarding the competition will be uploaded on the website of ATBS (www.atbs.in) in June/July every year.

Do visit www.atbs.in and participate in the competition in 2018!!

Recreation Corner .....



Official website of ATBS:

http://www.atbs.in

Email contact of editorial team:
Prof. B. B. Nath:
bbnath@unipune.ac.in
bbnath@gmail.com

Prof. Rekha Vartak:
rekha@hbcse.tifr.res.in

Ms. Anupama Ronad
anupama@hbcse.tifr.res.in

Contact for ATBS related queries:

Dr. P. G. Kale,
General Secretary, ATBS and
Retired Professor
Email: pgkale@gmail.com