BIOME
The BIOlogy Education Messenger
(An ATBS eNewsletter)

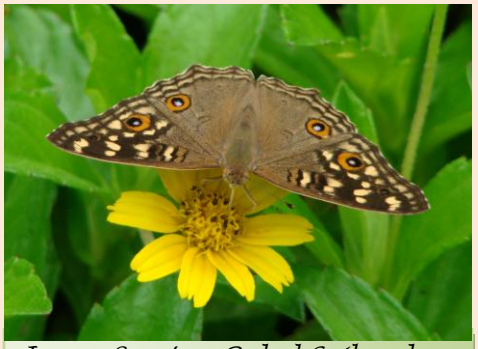


Image Courtesy: Rahul Gaikwad

Contents of this issue:

From The Editorial Team.....

It is with great pleasure that we are putting forth this first edition of the e-newsletter of the ATBS. We are sure that every member of this association especially those who are teachers by choice have had a 'teacher' through their student years who made an impact on their minds and hearts so much so that they chose to become a teacher. It is to all such teachers and to you that we would like to wish a very very happy and fulfilling teachers' day!!

We would like to congratulate all of you for the efforts that you take in an attempt to make the teaching and learning experience of science, especially the biological sciences more understandable and relevant. We hope this newsletter would add to this attempt and provide you with tried-n-tested teaching methods from your peer group. We encourage you to share with us your experiences as teachers and contribute articles which could be of use to others in their biology classrooms and laboratories. As part of the ATBS, you are also invited to send us your constructive feedback so that we can mould our further issues accordingly.

We hope to have many more enriching editions in the times to come.

Till then, we do hope you stay connected through the ATBS!

With best wishes.....

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

Rekha Vartak,
HBCSE, TIFR,
Mumbai

Anupama Ronad,
HBCSE, TIFR,
Mumbai

Prof. Arvind Kumar,
Former Director,
Homi Bhabha Centre for Science Education,
Tata Institute of Fundamental Research,
Mumbai, INDIA.

M E S S A G E

I am glad to know that the Association of Teachers in Biological Sciences (ATBS) is bringing out a periodic e-newsletter of ATBS. The objective of ATBS is to build a network of teachers dedicated to the cause of improving biology education in the country.

Biological sciences are witnessing an unprecedented growth in contemporary times and the importance of quality biology education in our schools and colleges has never been greater. ATBS has been responding to this need through its programmes at undergraduate levels and also through its academic contribution to the biology Olympiad programme. Though not a biologist myself, I was fortunate to have been modestly associated with the formation of this Association in 2006, when I was at the Homi Bhabha Centre for Science Education, Mumbai, and I am happy to see its steady growth since then.

On the occasion of launching of the inaugural issue of the e-newsletter of ATBS, I send my very best wishes to all the teachers and scientists working for the success of the vital aims and objectives of ATBS.

Prof. Arvind Kumar

Prof. (Dr.) Jayashree Ramadas
Director,
Homi Bhabha Centre for Science Education (TIFR), Mumbai.
INDIA.

MESSAGE

One of the felicitous outcomes of the science olympiad movement in India has been the formation and strengthening of science teacher associations: in particular, the Association of Teachers in Biological Sciences (ATBS). It is, in fact, the active participation of teachers from all around the country that sustains and nurtures the olympiad movement.

Biology teachers as a community face the challenge of keeping abreast of a diverse and rapidly transforming discipline, while meeting the demands of a continually changing student population. Allied sciences of chemistry, physics, mathematics, engineering, even computer science and psychology, are enriching and also staking claim on the life sciences. At the same time teachers find that their students are presented with a bewildering array of career options, amongst which the basic sciences struggle to hold their ground.

In this situation ATBS as a professional forum for biology teachers provides a much-needed platform for sharing experiences and effective practices, and initiating collaborations to develop good competitive courseware, as also informal learning resources in biology, particularly for the Indian context. Going ahead, I hope that ATBS will seed the idea of biology education research in the country, for which this newsletter may become an effective catalyst.

I wish ATBS and the newsletter all success.

Prof. Jayashree Ramadas

Prof. (Dr.) Vijay A. Singh
National Co-ordinator, Science Olympiads
Homi Bhabha Centre for Science Education (TIFR), Mumbai.
INDIA.

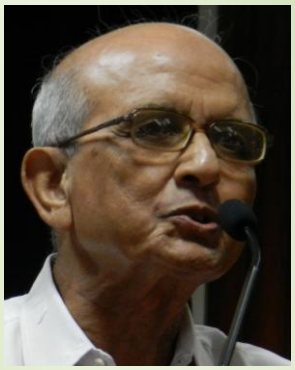
MESSAGE

Biology has been hailed as *the* defining science of the twenty first century. It now occupies an apex position flanked on one side by physics and chemistry and on the other by medicine and psychology among others. Its exuberant diversity inspires awe and wonder and presents both inspiration and challenge to scientists. Biology is not a collection of large number of facts unfortunately though it maybe taught as such in schools and colleges.

The Association of Teachers in Biological Sciences was formed seven years ago in 2006. Almost immediately it began efforts to disseminate quality material and strove to evolve a positive atmosphere for excellence in biology education. It began a fruitful partnership with the Indian Association of Physics Teachers to conduct the annual national standards examination in biology (NSEB) in over 900 centers across the country. It has organized workshops on novel biological techniques, seminars and expository lectures in biology. It has conducted friendly and informal contests for students. It has aided in identifying talent by contributing to the Indian Biology Olympiad effort. And all this with members who have worked voluntarily and who do not accept honoraria.

I was a founding member of ATBS. And I note with happiness that it now boasts of over 300 life members. The decision of the ATBS to launch a newsletter is a sign of its growing maturity. It will ensure dissemination of quality material and help evolve a positive atmosphere for excellence in biology education. It will weld together the community of biology teachers and provide a platform for dialogue and discussion. Here is wishing the newsletter all success. May it lead ATBS from strength to strength!

Prof. (Dr.) Vijay A. Singh



Prof. S. M. Karmarkar,
President, ATBS and
Former Dean,
Faculty of Science,
University of Mumbai.

MESSAGE

The Association of Teachers in Biological Sciences (ATBS) is launching a new e-periodical and it is a happy coincidence that its inaugural issue is slated for release on Teachers' Day i.e. September 5, 2013. Any venture which contributes to the enhancement or betterment of a teacher's knowledge base, more so on this auspicious day is always welcome and I am confident that teachers and researchers will seize this opportunity to use this platform judiciously to share their views on teaching and teaching methodology as well as their research findings with fellow teachers and researchers. Publishing a periodical and maintaining its regularity is an arduous and cumbersome task for this itself, in addition to the quality of articles, contributes in a large measure in sustaining the interest of its readers. I am confident that members of the association entrusted with this work will not be found wanting on this score. No doubt, this, besides active participation of its contributors, will go a long way in ensuring the success of the periodical.

I wish all its users happy, fruitful and enjoyable reading.

Prof. S.M.Karmarkar

Dr. P. G. Kale,
General Secretary, ATBS and Associate Prof. and Head, Dept. of Zoology,
Ramniranjan Jhunjhunwala College,
Ghatkopar, Mumbai 400086

Teacher Organizations like ATBS.....

- *IAPT Indian Association of Physics Teachers*
- *ACT Association of Chemistry Teachers*

The Association of Teachers in Biological Sciences (ATBS)
History & Genesis

Change is beyond doubt the essence of life, however lately the rate of change has accelerated so much that all sectors in the society cannot keep pace with them. To maintain the pace of 'development', a country or a society needs two types of professionals the most, teachers and scientists. While the latter ensure transformation of knowledge into technology, the former ensure the sustained availability of researchers and scientists. The current system of education in most countries fail to assure quantitative and qualitative growth in these professionals. To aid in resolving this problem the Science Olympiad Movement was launched. The main objective of this movement has been to attract talent into pure sciences.

The nodal agency for conducting the Olympiads in the sciences and mathematics is Homi Bhabha Centre for Science Education (HBCSE). The responsibility of organizing and conducting the first level screening test for selecting candidates for the National Team had been given to the Indian Association of Physics Teachers (IAPT), which was formed much earlier. The then Director of HBCSE, Prof. Arvind Kumar appealed to teachers to instate Teacher's Associations in Chemistry and Biology on the lines of IAPT. This was in October 2004. I volunteered to take up the task of initiating efforts to form the Association of Biology Teachers. Prof. R. M. Dharkar of IAPT promised to help me. Thus, with the efforts and encouragement of HBCSE, the Associations of Teachers in Chemistry and Biological Sciences were formed.

It was much easier to accept the responsibility than to carry it out. I soon experienced that Biology is a diverse discipline and that the teachers are compartmentalized as teachers in Botany, Zoology, Microbiology, Biotechnology, Life Sciences, Agriculture, Medicine and many more. To unite them under one head was rather difficult. Moreover, as soon as the idea of formation of Indian Association of Biology Teachers was conceived, Prof. Arvind Kumar received a letter claiming that an Association bearing the same name has already been functioning in UP. By

ATBS in a nutshell

- Formed in 2006
- Has 383 life members
- Has 2 institutional members
- Has 14 executive members
- Any teacher / researcher who wants to contribute to the improvement of biology education can become a member
- Email: iatbsmum@gmail.com
- Individual Life membership fee is Rs. 1000/- only
- Is a platform for teachers in biological sciences to discuss common issues and problems so as to work towards solutions for the same!

changing the name of the, yet to be conceived, organization to 'Indian Association of Teachers in Biological Sciences' could resolve both the issues.

In February 2005, a convention was organized at HBCSE to discuss the objectives, ad hoc executive committee and possible programs of the Association. The main objective of the Association was the upgradation of teaching and learning of subjects under Biological Sciences, both inside and outside the educational system. The Association was proposed to act as a common academic forum for the teachers under the wide umbrella of Biological Sciences. It was also supposed to work in close association with HBCSE to identify and nurture talent to promote excellence in Biological Sciences.

There was a fairly good response from the senior teachers not only in Biological Sciences but also in Physics and Chemistry. Many of them including HBCSE director, Prof. Arvind Kumar, Coordinator of Olympiads, Prof. Vijay Singh, Prof. R. M. Dharkar of IAPT became life members before even the membership forms and receipts were printed. Prof. Bharat Chattoo of School of Genetics, M. S. University, Baroda kindly accepted to be the president of the association; I was given the responsibility of being the General Secretary; Prof. Pravin Nayak became the treasurer and Dr. Milind Watwe, Dr. Shraddha Shimpi, Dr. Sasikumar Menon, Dr. Ajit Dange, Dr. M. C. Arunan, Dr. Siddhivinayak Barve and Dr. Rekha Vartak were the members of the ad hoc committee. All the necessary preparations were done and the Association was conceived officially in April 2006.

After its launch, it took 5 years to register the organization with the Charity Commissioner, Mumbai in 2011 only after the word 'Indian' was removed from the proposed name 'Indian Association of Teachers in Biological Sciences or IATBS'.
There is a provision for only two categories of membership - Life Members and Institutional Members. Currently there are 383 life members and only 2 institutional members. The Association has successfully organized workshops, seminars, conventions, competitions of oral presentation and poster presentations. Now, we also have a website 'www.atbs.in' where

the e-newsletter will be available. It has also been proposed to instate Proficiency Tests in Biology at UG and PG levels.

Though all the programs of ATBS are contributory, the Members of the Association get concession in registration fees for various workshops organized by the Association. The Resource Generation Camps organized by ATBS and HBCSE, the enrichment camps organized by HBCSE, Annual Convention of ATBS, in which the teacher members can participate give an academically satisfying experience. The Association is also planning to set a corpus fund for supporting research based activities. I hereby appeal to all the members to be good ambassadors of ATBS and promote teachers in Biology to become members and participate in all its activities to make it stronger.

Dr. Purushottam G. Kale

Activities of the ATBS.....

- Academic responsibility of the first level exam of the International Biology Olympiad namely the NSEB (National Standard Examination in Biology) held in November every year.
- Organizes Annual Convention on current themes.

- Conducts workshops to help refresh knowledge and skills of members

The Biology Olympiad Movement

Olympiads have been well known as 'World championship competitions', the first being held for mathematics in the year 1959. Participation of India in the International Olympiads began in mathematics in the year 1989. This is a competition just like the Olympic games but it covers academics – sciences, mathematics, astronomy and so on. It has been proved to be the test of vey high academic challenge for the bright students of the country.

Prof. Arvind Kumar, the former director of HBCSE, felt a strong need for such competitions in sciences such as physics, chemistry and biology. With a strong support from DAE and DST, this programme was initiated at HBCSE.

One may ask, our students are already burdened with innumerable exams and tests, then why have another exam/ competition to establish who is better and who is not? Other than the global aspect of the programme, what is it that makes the International Olympiads unique?

The International Olympiads are not just exams, they are an experience in itself. Any student who has attended the event will testify this. These events are 'movements' that the organizing bodies have been attempting to keep alive. The IBO is thus a movement with the following aims:

- To challenge and stimulate students to expand their talents and to promote their career as scientist
- To compare educational methods in biology, that will facilitate exchange experiences among academicians from all over the world
- To promote communication and cooperation between students, teachers and academic institutions from many countries

Students attending these Olympiads are the ones who love to take on academic challenges just like some of us may love to indulge in adventure sports. The Olympiad gives such students an opportunity to attempt such challenges and at the same time

The IBO……

- is the **International Biology Olympiad**, an international event held annually.
- It is a competition for the brightest biology students from around the world.
- The 24th IBO was held in Bern, Switzerland in July, 2013.
- Four-member teams from 62 countries participated in the event this year.
- Indian participation started in the year 2000.
- Every single Indian student competitor has won a medal so far!!
- The team this year won 3 silver medals and 1 bronze medal.
- The four team members for IBO – 2013 were:
  - Amogh Pathak, Nasik
  - Anurag Limdi, Surat
  - Ratul Maji, Howrah
  - Umang Arora, Delhi

The four-stage process for selecting & training the Indian team for the IBO……..

- Stage I: National Standard Examination in Biology (NSEB)
- Stage II: Indian National Biology Olympiad (INBO)
- Stage III: Orientation cum Selection Camp (OCSC)
- Stage IV: Pre-departure Training Camp (PDTC)

IBO

have fun and make friends with some of the best students in other parts of the world who probably someday would be their contemporaries in the various research careers that these students may pursue.

The first Indian team of 4 students participated at the International Biology Olympiad (IBO) in the year 2000. Since then, every year, all the participants of the Indian team have won medals for the country.

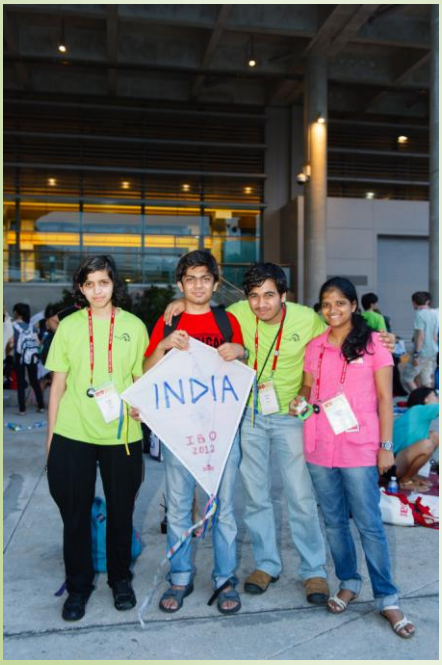
The IBO competition has two components: theoretical tasks and the experimental tasks. The theory syllabus covers all aspects of life sciences such as cell and molecular biology, study of plants and animals, ecology, genetics, evolution, systematics and ethology. The theoretical tasks are challenging and test students' understanding of concepts as well as analytical and reasoning capacity. The inclusion of subjects such as ethology, cellular and molecular biology in the syllabus gives students an exposure to modern areas of biology research.

There are several national level examinations that cater admissions to various prestigious institutes in the country. However, none of these competitions test students' experimental abilities and skills. This makes Olympiads a special and unique international competition. Every host country develops innovative laboratory experimental tests in four areas of their interest. Many such experiments have been developed in areas such as dendroecology, evolutionary ethology, biochemistry and cladistics.

In order to participate in the international competition, each country needs to have an official National biology Olympiad programme. We, at HBCSE, work towards the selection and orientation of students for this programme. It is an intensive academic programme where resource persons from various universities, institutes of the country participate.

Many of the theoretical tasks developed for this competition focus on students' understanding of the concepts in the subject. Following is one such example:

Team INDIA at the IBOs.....



Question:

Number of DNA molecules present in the nucleus of somatic cell is:

a. 23
b. 46
c. 10^6
d. 10^9

The concept here is that each chromosome is a single DNA molecule. (It is worthwhile to note that only 47 % of the top 300 students selected from a countrywide test correctly answered this question.)

Olympiad programme as a whole gives a strong boost for content development, for formulating very high quality testing material and also a platform where scientists and bright students from across the country come together on a common platform and interact.

ATBS has been playing a very important role in the first level of National Olympiad examination (National Standard examination in Biology – NSEB). We expect that more and more teachers strengthen it further and actively participate in the biology Olympiad programme in different ways.

Dr. Rekha Vartak
Academic Co-ordinator,
Biology Olympiad Programme.

Students doing the experimental tasks……..

In the Bio Lab……..

We, the members of the Biology Olympiad Cell at HBCSE, attempt to develop new lab activities in various areas of biology each year. We feel that these activities, if disseminated to teachers would serve the larger purpose of students doing hands-on biology rather than rote learning of the theory which is a major deterrent for most students. We hope to include at least one small experiment in every issue of the ATBS e-newsletter so as to reach out to all the readers!

CHLOROPHYLL CONTENT ESTIMATION OF SUN AND SHADE PLANTS

Plants utilize the visible spectrum of light to synthesize their own food. They show various adaptations for the environment in which they dwell. Among various physiological adaptations, synthesis of chlorophyll pigments can provide information about the habitat of the plant such as sunny versus a habitat with low-light intensity.

In this task, you will be determining the relative concentrations of chlorophyll a and b in two plant species and correlating them to their possible habitats.

One plant can be any indoor plant such as *Dracena* (commonly known as lucky bamboo plant) and another can be any plant that grows in bright sun such as *Jasminum* species (e.g. mogra).

Specimen:

1. Mature leaf of *Dracena* weighing about 0.15 g
2. Mature leaf of *Jasminum* weighing about 0.15 g

Materials:

1. Glass pipette (10 ml)
2. Glass pipette (1 ml)
3. Mortar and pestle
4. Filter paper
5. Funnel
6. Test tubes
7. Aluminium foil
8. Cuvettes

Instruments:

1. Spectrophotometer
2. Weighing balance

Chemicals:

1. Acetone
2. Distilled water

Procedure:

1. Prepare 20 ml of 80% acetone using distilled water as a diluent.
2. Cut *Dracena* leaf specimen into small pieces using the scissors. Put them into a clean mortar.
3. Add 2ml of 80% acetone and macerate the pieces well. Add an additional 3 ml solvent and again macerate so as to get a good concentrated extract.
4. Place a filter paper in the funnel and filter the extract into a test tube.
5. Cover the test tube with a piece of aluminium foil.
6. Repeat steps 1 – 5 for the *Jasminum* leaf using a fresh mortar and pestle.
7. Adjust the spectrophotometer to 646nm.
8. Adjust the absorbance value to zero using 80% acetone as a blank.
9. Read the absorbance of both samples. Note down the readings.
10. Adjust the spectrophotometer to 663nm.
11. Repeat steps 8-9 for this wavelength.

Calculations:

1. Calculate the **chlorophyll a** content (µg/ml) using the following formula [1]:

   $(12.21 \times OD_{663nm}) - (2.81 \times OD_{646nm})$

2. Calculate the **chlorophyll b** content (µg/ml) using the following formula[1]:

   $(20.13 \times OD_{646nm}) - (5.03 \times OD_{663nm})$

3. Calculate the ratio of chlorophyll a to chlorophyll b content.
4. Fill in the values for the two specimens in the table below.

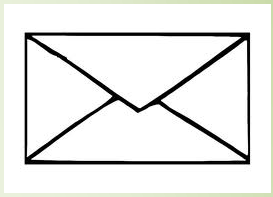
	Chlorophyll a content (µg/ml)	Chlorophyll b content (µg/ml)	Ratio of Chlorophyll a to Chlorophyll b content
Dracena			
Jasminum sp			

Students' understanding of the results can be assessed by discussing various points such as the role of chlorophyll a as 'reaction centre pigment', role of chlorophyll b as 'antenna pigment', the light gathering capacity of chlorophyll b and the regulation of its synthesis depending on the availability of light. Also, other plant types which would show chlorophyll ratios similar to sun or shade plants can be discussed.

---- By the Biology Olympiad Cell,
HBCSE, TIFR

References:

1. Lichtenthaler, HK and AR Wellburn (1983): Determinations of total carotenoids and chlorophylls a and b of leaf extracts in different solvents. Biochemical Society Transactions 11: 591 - 592.



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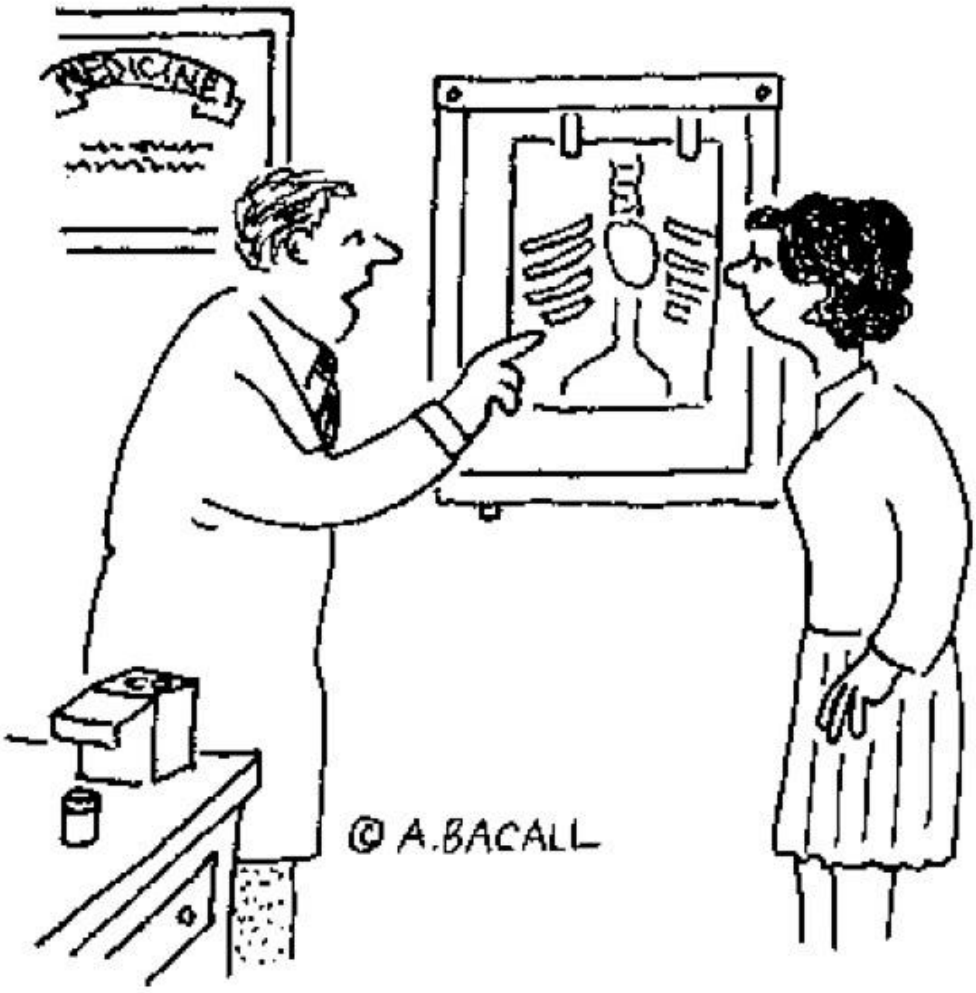
Recreation Corner .....



"Your heart is slightly bigger than the average human heart, but that's because you're a teacher."—Cartoon by A. Bacall

Source: http://www.teachers.ab.ca

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