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Meeting report: International Symposium on Ciliate Biology held at Sri Guru Tegh Bahadur (SGTB) Khalsa College, University of Delhi, February 6—7, 2007

The International Symposium on Ciliate Biology was the first such event held in India. It was the dream idea of Dr. Komal Kamra, Department of Zoology, SGTB Khalsa College, and Dr. Renu Gupta, Department of Zoology, University of Delhi. They had the administrative support of Dr. Jaswinder Singh, Principal of SGTB Khalsa College, the ciliate biology research group of the College and the University of Delhi, and the scientific advice of Prof. G. R. Sapra and Prof. Rup Lal, Department of Zoology, University of Delhi, and Dr. Alan Warren, Natural History Museum, London.

The two major aims of the meeting were to focus on various aspects of the biology of the ciliated protists and to provide a platform for interaction among younger life science students, both undergraduate and graduate, and senior scientists. In two intense days, these aims were achieved: 15 senior scientists from China to Canada and three Indian ciliatologists made authoritative presentations in various fields of ciliate biology while there was enthusiastic attendance by the students whose numbers exceeded 300.

On the first day, Prof. Klaus Hausmann, Berlin, began with an overview entitled "*The Amazing and Fascinating World of Ciliates*", touching on the history of the study of ciliates. With beautiful illustrations and music videos, Prof. Hausmann introduced these organisms as models in fields of study as diverse as cell biology and ecology. Prof. David Montagnes, Liverpool, followed with "*Ciliates as Key Players in Pelagic Food Webs*" in which he emphasized ciliate abundance and presence in pelagic food webs. Dr. Montagnes provided insights into their ecology by using mathematical models and stressed that we should NOT imagine them as "little animals" — their boom-and-bust population changes can take place over the order of days. Prof. Adriana Vallesi gave a presentation by Prof. Piero Luporini, Camerino, whose lab has been investigating cold-adapted hypotrich species of the genus *Euplotes*. In this talk entitled "*Antarctic Ciliates and their Cold Adaptations*", Prof. Luporini provided molecular evidence that their translation machinery was efficient and their sexual pheromones were more soluble and more flexible in the cold environment than non-psychrophilic species. Prof Weibo Song, Qingdao, summarized the immense taxonomic efforts of his research group in his talk, "*Marine Ciliate Research in China*". Mainly looking at taxa in the Yellow and Bohai Seas, China, Prof. Song gave the students an idea of how one describes a ciliate as he summarized investigations on over 400 species, 150 of these giving rise to new taxa and over 90 species being investigated through molecular techniques. Prof. Yuri Mazei, Petersburg, argued that ciliates are good ecological models because they have short generation times and yet also form complex and variable communities. In over 16 years of research with Prof. Burkovsky on the White Sea, which amounts to 3000 generations of ciliates, Prof. Mazei demonstrated that species richness and evenness were quite stable in his talk, "*Changes in Psammophilous Ciliate Community Structure*".

After a delicious lunch of a variety of Indian dishes, Prof. John Kloetzel, Baltimore, focused on how proteins might coassemble to shape a cell, arguing that ciliates were excellent models with their complex cytoskeleton that might disassemble/assemble each day. In his talk, "*The* Euplotes *Cortex — Cytoskeletal Molecular Diversity*", Prof. Kloetzel provided beautiful photographic evidence of his elegant research on plateins, cageins, and centrins. Prof. Cristina Miceli, Camerino, followed with a wide-ranging presentation on "*The Tubulin*

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Superfamily: Functional Genomics, Adaptation", in which she demonstrated that tubulins of the cold-adapted *Euplotes focardi* had a more stable hydrophobic core and more flexible lateral interactions than tubulins from non-cold-adapted species. Prof. Alan Warren, London, UK, summarized research on "*Morphology and Diversity of Marine Peritrichs*", an important group of ciliate as bioindicators of water quality and as ectoparasites on a variety of marine organisms. Prof. Klaus Hausmann, Berlin, ended an idea-filled first day by reviewing ultrastructural aspects of food acquisition by filter feeders and "gulpers". In his talk, "*Cell Biological Aspects of Food Acquisition and Digestion*", he showed evidence that digestion could have two main stages in *Pseudomicrothorax* and *Homalozoon*: 1) rapid destruction of food in a giant food vacuole; and 2) vesiculation of this vacuole to distribute nutrients.

We finished the first day with an evening of Punjabi entertainment and food. The students of SGTB Khalsa College assembled to demonstrate some traditional women's and men's dances. Their costumes were colorful, their dances were extremely energetic, and they demonstrated tremendous enjoyment and dedication. We were all enthralled just watching them! The dancing was followed by a full course meal of more delicious foods of India.

Our second day began with a one-hour Poster Session where students and faculty from Delhi and all over India had organized presentations of their work. It was a time, too short in the end, for everyone to enthusiastically engage in discussion of the future directions of all the exciting projects being undertaken by graduate students in India.

The oral presentations began with Prof. Adriana Vallesi, Camerino, summarizing their research on the "*Biology and Evolution of the* Euplotes *Pheromone System*". She argued that the pheromones had both paracrine (i.e. mate inducing) and autocrine (i.e. growth promoting) functions, and convincingly demonstrated that the latter occurs through MAPK activation. Prof. Denis Lynn, Guelph, provided a summary of the diversity of ciliates as he characterized the 2 subphyla and 11 classes in his talk "*The Ciliated Protozoa — 3rd Edition and New Systematics*". Prof. Warren then presented a second talk entitled "*What Happens After You Flush the Toilet?*" in which he summarized the important role of ciliates in wastewater treatment processes. He introduced a multi-media user-friendly guide to the identification of the over 90 genera of ciliates that enable protistologists to assess effluent quality and so assess the operating efficiency of a treatment plant. Prof. Dieter Ammermann, Tübingen, was the first of two talks that examined the genomes of ciliates. In his overview of "*The Special Genomes of Ciliates*", Prof. Ammermann took us through an elegant demonstration of reductionist science. They had probed the control of gene expression in the stichotrich *Stylonychia*, which apparently does not control copy number of the genes in its macronucleus. Prof. Miceli presented a talk provided by Prof. Eduardo Orias, Santa Barbara, on "*The* Tetrahymena thermophila *Genome Project*" whose macronuclear genome does exhibit copy-number control. One of the intriguing outcomes of early genome analysis is the evidence of lineage-specific gene family expansions, for example in tubulins, transporters, and protein kinases, suggesting a tremendous functional diversity.

During the mid-day, we rushed lunch, spending far too little time to savour the Indian cuisine. The final session focused on symbionts — both symbionts of ciliates and ciliates as symbionts. Prof. Sergei Fokin, Pisa and Petersburg, summarized his research on "*Bacterial Endocytobionts's Biodiversity in Ciliates*". Prof. Fokin noted that these were mainly alpha-proteobacteria that infected almost every part of the cell. The other three talks in this session were presented by Indian colleagues. Prof. Probir Bandyopadhyay, Kalyani, summarized research on "*Ectoparasitic Trichodinids: An Overview*" in which he reported that 7 of 9 trichodinid genera have been found on a variety of mainly vertebrates in India, causing the especially fatal disease trichodiniasis in young fish fry in aquaculture. Prof. C. Kalavati, Visakhapatnam, presented an intriguing discussion of the "*Endocommensal Ciliates in Amphibians*". She challenged us to be concerned not only about the loss of amphibian species, but also at the loss of their endocommensals, of which 14 endocommensal ciliates species have been eliminated in the adult stages of frogs in India over the past 20 years. Finally, Dr. Amlan Mitra, Kalyani, returned to the examination of trichodinids in his talk, "*Biodiversity of Ectoparasitic Trichodinids from Fishes*". Dr. Mitra reported on the discovery of over 20 new species of trichodinids on almost 20 species of fishes in West Bengal. European, African, and Asian trichodinids have been discovered, some species probably introduced to the Indian subcontinent by humans bringing in host fish.

In reflection, the Symposium provided an exciting opportunity for international colleagues to discuss again important discoveries and new problems in the broad areas of ciliate biology.

I am sure that it will have served to inspire both undergraduate and graduate students in India to embark on studies in ciliate biology and/or to continue their efforts to increase the professional profile of protistology at universities across this vast and increasingly important country. The organizing committee is to be congratulated for all the efforts made to achieve this success. May it be only the first in a lineage of International Symposia on Ciliate Biology to be held in India from time to time! Abstracts of the meeting are available at the following URL - http://www.uga.edu/~protozoa/meetings/past_meet.html#indiaciliates

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