Message From the President

This first year of publishing *Invertebrate Biology* both in print and online with Blackwell has been an exciting one for AMS. Editor Pat Reynolds reports below on news that the entire run of AMS’s publications is available online through JSTOR and Blackwell. This is a major achievement and a tremendous opportunity for readers of *IB*, and we all owe Pat our sincere thanks for his efforts in bringing this about.

Not surprisingly, all of this feels somewhat experimental, as we adapt to digital access of our journal. While we are waiting to see how these changes will affect trends in readership and membership, much more than our own Society’s transition is currently taking place: the entire practice of research publishing is undergoing global climate change, and most other scientific societies are experiencing similar new pressures.

So the challenges facing AMS (such as some decline in membership) must be viewed within this larger context. At the same time, we must not simply drift but must carefully consider many options and try to choose the best path for our Society in today’s shifting sands. What are our goals and priorities, and how can we best apply ourselves and our resources to advancing them?

One of our priorities is the training of young scientists. We are delighted to see that student membership in AMS is up, and this year’s Fellowship Committee was faced with the happy challenge of receiving a number of excellent applications to its summer Student Research Fellowship. So, as you read in last Spring’s Newsletter, President-Elect Carole Hickman (committee chair), Past-President Clay Cook, and I decided to expand the awards: besides the usual fellowship of past years, two smaller grants were also awarded. The three young researchers who received funding present preliminary reports in this Fall’s Newsletter.

I will look forward to seeing many of you at our annual meeting: 4-8 January 2006 in Orlando. AMS Program Officer Kathy Coates has been working hard to schedule a fine program for us. This year our usual past-presidential address will be replaced by an AMS Distinguished Scientist Lecture: Prof. Kevin Eckelbarger will present an illustrated history of invertebrate zoology and zoologists in America, an event not to be missed. Watch the program for Kevin’s talk, “The Dawn of Invertebrate Zoology in America: A Tribute to the Pioneers.” AMS is also co-sponsoring two symposia, “Integrating Function over Marine Life Cycles” and “Zebrafish in Comparative Context.” Please bring your best...
photomicrographs to enter in the Buchsbaum contest, attend the Joint Social and the AMS Luncheon, participate in the AMS general business meeting, and visit our booth in Exhibits!

Meanwhile, please take a moment to renew your AMS membership for 2006. The rate remains at the same low level --- a bargain by any standard, with both print and on-line versions of the journal included. Please also encourage your students and colleagues to join or renew AMS. The best and quickest way is to visit http://www.amicros.org/ and click on “Membership application and renewal” in the sidebar. Or, if you are already a member, you can wait for a printed renewal form in the mail. To receive 20% off on Blackwell books and journals, just mention your AMS membership and request the discount when placing any order. The Society appreciates your continuing loyalty, which supports our journal and our programs to encourage and maintain skills in microscopy and photomicrography.

Our heartfelt sympathies to all affected by the hurricanes. Where mail has been interrupted to members, Blackwell is working with us to make sure you get your journal. Please let us know of any address changes or delivery problems.

Best wishes to all. Hope to see you in Orlando!

Vicki Pearse
AMS President

Please Participate!

Though our journal remains the centerpiece of AMS and is certainly our most visible product, the Society's other activities shine with their own light. We are proud to offer funding for Student Research each summer. We sponsor stimulating Symposia at the annual meetings and a Contest celebrating skills in Photomicrography. And this year we are working on an exciting new Web Site.

Please participate-AMS wants your active involvement! Encourage your students to apply for the summer Research Fellowships. Organize a symposium. Enter your images in the Contest. Visit the Web site and tell us what you use or wish for. Other ideas for how AMS can promote invertebrate and microscopical science? Send them!

Please also sustain these goals with your contributions to our endowed Funds. The Ralph & Mildred Buchsbaum Fund primarily supports the Contest in Photomicrography and the Fellowships, and the Spencer-Tolles Fund supports publications, including the Web Site. The Society waits hopefully and gratefully for your check, payable to AMS, sent to our Treasurer: Dr. Bruce Conn, School of Mathematical & Natural Sciences, Berry College, 2277 Martha Berry Hwy. NW, Mount Berry, Georgia 30149-5036.

Thank you!

Message From the Editor of Invertebrate Biology

Greetings to all!

The 125th year of publication of the Society's journal has been a busy one. I want to start this message with a heartfelt "thank you" to the Co-Editor of IB, Susie Balser. She has done a tremendous amount of work this year; please extend to her the membership's appreciation should you see her at the meetings in Orlando. I am also pleased to welcome an additional Co-Editor to the team, Bruno Pernet (California State University, Long Beach). Bruno has been a submitting author and frequent reviewer for IB in the past, and we are fortunate to have his scientific judgment and writing skills in the Editorial Office.

The expansion of the editorial team is warranted by a record number of submissions to IB this year (69 to date), and already a substantial increase over the last few years. We also continue to be pleased with the breadth and strength of the papers being accepted and published, with many fields represented that are quite removed from microscopy, but...
of course under the broad rubric of invertebrate biology. There are probably several reasons for the increased submissions. As you know, this year's vol. 124 was the first published in partnership with Blackwell Publishing; the transition has required an enormous effort on several fronts (thank you again, Susie), and we have worked hard to maintain the high production standards of the journal. But the benefits to the journal have been many fold: online subscription and renewal (http://www.blackwellpublishing.com/IVB), online submission, expanded online indexing, and perhaps most importantly, online publication of the journal. In addition to the current volume, Blackwell has published the last five years of the journal online (html and pdf, on their Synergy website). The effects of this are to bring the journal to a wider readership and, we expect, an increase in citations of the articles we publish and the impact factor of the journal. I will be reporting on these items in more detail at the annual meeting. Of particular interest to potential authors is that IB no longer has page charges, color plates are published at no cost to the author (with editorial approval of scientific value), and an option for authors to publish their articles "Open Access" will be available from 1 January 2006. Please join the crowd and consider submitting your manuscripts to IB at: <http://mc.manuscriptcentral.com/invbio>.

As I wrote in the spring newsletter, JSTOR, the not-for-profit online digital archive, had agreed to include the "legacy material" of the journal, extending right back to the first issue published in 1880 (as Proceedings of the American Society of Microscopists, 1878–1879), in their Biological Sciences Collection. As you may have noticed in the last issue of IB, JSTOR announced the release of the AMS material last August. JSTOR includes everything up to a 5-year moving window of most recent issues; along with the Blackwell's Synergy 5-year backdating, the entire 125 years of the journal have become available online this year. I hope you have a chance to browse some of it!

Thank you again for your support of Invertebrate Biology through your membership in AMS.

Sincerely,
Pat Reynolds

Charles Herbert Ellis, Jr
(1941 - 2005)

We are deeply saddened by the death of Charles H. Ellis, Jr., who died on June 11, 2005 of an apparent heart attack following a routine dive at the Marine Science Center, Nahant, MA. Charlie served on the AMS Executive Committee as Member-at-Large, 1995-1997, as well as being active in SICB. Charlie was someone we always looked forward to seeing at the annual meetings, invariably a pleasant, interesting, warm, thoughtful presence. Someone we will always miss.

Born in Pasadena, CA, on March 14, 1941, he was raised in Scarsdale, NY, graduated from Swarthmore College in PA, and received his doctorate from Johns Hopkins University in Baltimore, MD. He taught at Amherst College (1966 to 1971) before joining the faculty of Northeastern University, where he offered Genetics and Developmental Biology courses and was honored by an Excellence in Teaching award. His primary research interest was in developmental and reproductive biology of marine flatworms, though his lab fostered a diversity of interests and projects on a broad spectrum of organisms. And somehow, amazingly, Charlie's impressively long list of diverse campus and community service contributions still left time for a whole other life in music: an accomplished performing cellist, he also contributed much time and energy in support of numerous regional musical organizations.

Those of us who knew and treasured him solely from the brief swirl of our annual meetings can only imagine the feeling of loss by his family and by the communities to which he gave so much over the years, now tragically cut short.

Vicki Pearse
AMS President
American Microscopical Society Student Research Fellowship Reports

Anatoly Petrov
Department of Biological Sciences

Confocal microscopy and taxonomic identification: evidence of the circumboreal distribution of *Aphanostoma virescens*

Objective: To collect and identify specimens of Acoela from Maine and the area around Bamfield Marine Science Centre, Canada, BC. Surprisingly, one species from Orr Cove, Maine, namely, *Aphanostoma virescens* Ørsted, 1845, appeared to be present also in British Columbia, so a specific objective became to test their affiliation. Additional goals were to examine male and female reproductive organs in collected animals using both histological methods and fluorescence microscopy, and to establish the status of the species within the genus, as well as the position of the genus in the system of acoels.

Introduction: The Acoela is a group of predominantly marine free-living worms that are now a focus of attention as molecular data showed them to be the earliest descendants of basal bilaterians (see, for example Ruiz-Trillo et al. 1999). The taxonomy of such morphologically simple animals meets certain difficulties; it has to rely on only a few characters, largely associated with organs of the reproductive system. Unfortunately, many significant features of reproductive organs are difficult to identify by conventional histological methods. Fluorescently labeled markers (such as phalloidin staining of F-actin) and confocal microscopy are methods that offer much better resolution than routine histological sectioning. Phalloidin staining was recently employed to establish patterns of body wall and penis musculature in acoels, and their implications for the taxonomy of the group were thoroughly investigated (Hooge and Tyler 2005). Thus, a large heterogeneous family, the Convolutidae, could be seen to comprise a subgroup with penial musculature sufficiently distinctive to warrant establishing a new family Isodiametridae from it. The seminal bursa (accessory female organ accepting and storing allosperm) and its sclerotized appendage (nozzle or mouthpiece) are other reproductive structures that may prove useful for taxonomic distinctions.

Although *Aphanostoma virescens* is a common European species that was discovered more than 150 years ago, no detailed description of this acoel has been published. Outside Europe, *A. virescens* is so far known only from Greenland.

Methods: Specimens of *Aphanostoma virescens* (Orr Cove, Maine, and near Bamfield Marine Science Centre, Canada, BC) were extracted from red algae using the magnesium-chloride decantation method (Sterrer, 1971). European specimens of *A. virescens* were washed off filamentous green algae in the vicinity of the White Sea Biological Station Kar-tesh (Russia). Specimens from all sites were embedded in epoxy resin and sectioned for light microscopy. Confocal images were obtained of whole mounts from Maine and BC fixed with 4% formaldehyde and stained with fluorescently labeled phalloidin (Alexa 488; Molecular probes, Eugene, OR).
Results & Discussion: Animals collected from Maine and BC share a set of characters coincidental with those described for Aphanostoma virescens (Graff, 1882; Steinböck, 1931). Their affiliation with A. virescens was additionally confirmed by comparison with sectioned specimens of A. virescens collected in the White Sea (Russia). The most distinguishing character of the genus is the bursal cap, anterioventral extension on the wall of the seminal bursa (Fig. 1). Confocal images of both Pacific and Atlantic A. virescens show the cap comprising 5-7 sclerotized rings or units reinforced by non-muscular actin (Fig. 2, sr). Ultrastructural examination of another species of Aphanostoma, A. bruscai, has shown, that allosperm pass through these rings on the way to the oocytes (Petrov et al., submitted). Characteristic feature of A. virescens, absent in A. bruscai, is the presence of strong circular muscles surrounding both bursa and bursal cap (Fig. 2, bm). These muscles lie between the sclerotized rings of the bursal cap and most likely represent derivatives of the circular musculature of the gonopore (gp). The identical morphology of penial musculature and sclerotized elements of the bursa in Maine and BC specimens shows that they belong to the same species.

Fig. 1. Squeeze preparation showing the arrangement of the reproductive organs in Aphanostoma virescens. Fig. 2. Confocal image of phallloid stained specimen showing the sclerotized rings of the bursal cap. Fig. 3. Confocal image of the male copulatory organ with a penis of the isodiametric type. b – bursa; bc – bursal cap; bm – bursal muscles; br – bursal rings; gp – gonopore; p – penis; sv – seminal vesicle.

The curved penis is more or less constant in diameter throughout its length; it comprises 20-25 non-anatomosing longitudinal muscles (Fig. 3). This muscle arrangement is characteristic of the Isodiametridae and supports the position of the species within this newly established family. A. bruscai also possesses a type of male copulatory organ with an isodiametric penis, but the penis includes only a few (less than 10) wide longitudinal muscular bands (unpublished ultrastructural data).

Discovery of A. virescens on both the East and West Coast of North America is strong evidence of its circumboreal distribution: the invasion of this species into the Pacific Ocean most likely occurred via the Beaufort Sea, which makes it possible that A. virescens is present also in the seas of the Far East.

Acknowledgements: The funds awarded from this fellowship were used to cover the expenses for the field trip to Bamfield Marine Science Centre, British Columbia, Canada. I thank the American Microscopy Society for this financial support of my research.

References:
Apoptosis or programmed cell death plays an essential role in the development of multicellular organisms by eliminating damaged or unneeded cells. Research in a diverse array of metazoans has shown that apoptosis can be employed in a variety of developmental contexts from oogenesis to adult homeostasis (see Seminars in Cell & Developmental Biology vol. 16 n. 2). Furthermore, a portion of the genes in the apoptosis cell-signaling pathway is ancient dating back to the earliest of metazoans. Homologs of caspase and bcl-2 family members have been identified in sponges (Wiens et al. 2003) and cnidarians (David et al. 2005 and references therein). Within the Cnidaria, apoptosis has been described and/or characterized in three species: Haliplanella lineata (Mire & Venable 1999), Hydractinia echinata (Seipp et al. 2001), and Hydra (reviewed by David et al. 2005). Considering just these species, apoptosis is utilized for a number of development and regulative processes from gametogenesis in Hydra to adult longitudinal fission in Haliplanella.

Adult Nematostella vectensis

Apoptosis in the life histories of two Edwaersiid sea anemones, Nematostella vectensis and Edwardsiella lineata: occurrence, genes, and an inferred pathway
I am working on building upon this previous research concerning apoptosis in cnidarians by studying two related Edwardsiid anemones, *Nematostella vectensis* and *Edwardsiella lineata*. To this end, I am looking at timing and relative amount of apoptotic cells as well as utilizing genomic tools to identify genes involved in known metazoan apoptotic pathways. To identify apoptotic cells, I am following the protocol published by Seipp *et al.* (2001) that uses TUNEL reagent with the cell-death-detection kit manufactured by Roche. I have assayed for TUNEL positive cells in major developmental stages for each species. For *N. vectensis*, these stages include early and late planula stages, juveniles, and asexually reproducing adults. For *E. lineata*, I have assayed the endoparasitic stage, planula, juvenile, and asexually reproducing parasites. Thus far, I have only observed substantial apoptosis in *E. lineata*, particularly in individuals transitioning from the parasite to planula stage and from the planula to juvenile stage. Apoptotic cells are concentrated in ectodermal cells at the aboral end of the individual.

Curiously, I have not detected apoptotic cells in individuals undergoing transverse fission for either species despite assaying multiple individuals at different stages in this process. I have been optimizing the procedure to be more confident in assessing these negative results. Secondly, in an effort to characterize the antiquity of the apoptotic pathway, I, in collaboration with Joseph Ryan also of Boston University, have used bioinformatics tools to identify conserved genetic elements of the apoptotic pathway in *N. vectensis*. We have used BLAST and domain-centered searches against a draft sequence of the *N. vectensis* genome to identify representatives for four gene families common to triploblast apoptotic pathways: caspase, Bcl-2, TNF, and IAP. *N. vectensis* contains predicted genes in each family, many with orthologs to vertebrate/insect genes suggesting that these gene families had diversified to varying extents prior to the cnidarian-bilaterian split. Based on the apoptosis-related genes held in common by *N. vectensis* and bilaterians as well as the similarity of the apoptotic pathway in *Drosophila melanogaster* and *Homo sapiens*, we are working on a hypothetic gene network for apoptosis in *N. vectensis*.

I will have a poster at the AMS table at the 2006 SICB meeting in Orlando reporting on this project.

**References:**


Neural Mechanisms of Host Behavior Modification in the California Killifish

**Objective:** To reveal the neurobiological mechanisms by which a brain-encysting parasite alters the swimming behavior of its killifish host

**Introduction:** Like real-life characters from a horror film, some parasites can manipulate their host’s behavior in dramatic ways that often benefit the parasite. These parasites usually lead complex life cycles, requiring an exact sequence of hosts in order to complete their life cycles. As a result, the host’s behavioral changes often increase transmission of the parasite from one host to the next. These manipulations are not side effects of pathology, but active exploitations of specific behaviors. Thus, host behavior modification by parasites presents a unique circumstance under which to examine the neural basis of behavior.

The California killifish (*F. parvipinnis*) lives in estuaries along Southern and Baja California. In most of these wetlands, all killifish over a minimum size are infected with larval stages of the trematode parasite *Euhaplorchis californiensis*. *E. californiensis* utilizes three hosts in its life cycle: mud snails (*Cerithidea californica*), killifish, and piscivorous birds. Infected killifish display four times as many conspicuous swimming behaviors as uninfected ones, which renders them thirty times more likely to be eaten by a bird, the parasite’s final host (Lafferty and Morris 1996). Despite the presence of several hundred cysts packed around their brains, infected killifish appear otherwise healthy, schooling and reproducing normally.

Although behavior modification has been postulated for many systems as a parasite strategy to increase transmission between hosts (Holmes and Bethel 1972, Moore and Gotelli 1990), the underlying neurobiological mechanisms of this phenomenon remain relatively unknown. Furthermore, no one has worked out the physiological processes for a system with documented parasite-increased susceptibility to predation (PISP). Preliminary work shows that *E. californiensis* secretes two fibroblast growth factors (FGFs 2 and 8) when isolated in vitro (LaClair & Lafferty, unpublished data). Additionally, host fibroblasts have been shown to encapsulate the parasite cyst in a similar system (So and Wittrock 1982). This study utilizes immunohistochemical methods to examine differences in neuroanatomy and FGF activity in uninfected and infected killifish brain tissue.

**Methods:** Killifish were collected from the UCSB Campus Lagoon (uninfected) and Carpinteria Salt Marsh (infected), in Santa Barbara County. The brains of sixteen killifish (8 uninfected, 8 infected) were prepared for immunohistochemical processing. Briefly, tissue was fixed in 4% paraformaldehyde overnight, equilibrated in 20% sucrose phosphate buffer solution, embedded in gelatin and frozen. 16 μm thick coronal sections were cut on a cryostat microtome and collected on gelatinized slides.
Future Work: Once optimal concentrations of antibodies are determined for use with fish tissue, tissue will be immunostained with antibodies to neurofilament, laminin, and fibroblast growth factor 2. Neuron densities (neurons/mm²) will be quantified for comparison between infected brains and uninfected controls.

Fellowship Budget: The fellowship award was used to purchase an antibody for FGF-2. I thank the American Microscopical Society for their encouragement and financial support of student research.

References:

Annual Meeting of the American Microscopical Society

January 4-8, 2006
Buena Vista Palace Resort and Spa in the Walt Disney World Resort
Orlando, FL

The American Microscopical Society (AMS) holds its annual meetings jointly with meetings of the Society for Integrative and Comparative Biology (SICB, formerly American Society of Zoolologists) and The Crustacean Society. AMS sponsors contributed-paper sessions jointly with the SICB Division of Invertebrate Zoology at these meetings as well as symposia proposed by its members. The Society's annual Business meeting, past-presidential address,
luncheon, and joint social with members of the Division of Invertebrate Zoology (DIZ) are also regularly scheduled in the annual meetings.

In addition to a diversity of SICB divisional symposia, other events to be offered by the meetings include workshops, educational opportunities, socials, and commercial exhibits. AMS will be among the exhibitors; all meeting participants are warmly invited to drop by our booth.

**Selected Symposia at January, 2006, meeting:**

(See full list at [SICB Symposia Site](http://sicb.org).

"Integrating Function over Marine Life Cycles" [Sponsored by AMS]
"Metamorphosis: A Multi-Kingdom Approach"
"Recent Developments in Neurobiology"
"Genomic and Proteomic Approaches in Crustacean Biology"
"Movers and Shakers: The Evolution and Development of Mesoderm"
"Biomechanics and Neuromuscular Control"
"Zebrafish in Comparative Context" [Sponsored by AMS]

(continued on next page)
THE RALPH AND MILDRED BUCHSBAUM PRIZE FOR EXCELLENCE IN PHOTOMICROGRAPHY

Do you have a favorite photomicrograph you'd like others to see? It could be a winner!

Prize

• Publication in Invertebrate Biology
• Featured in www.amicros.org
• Cash award
• Book - SEA LIFE IN FOCUS, A Memoir (2002) by D.P. Wilson, describing pioneering struggles and methods in photographing marine animals
• Winners are guests at the AMS Luncheon in Phoenix, 2007

Location

AMS Exhibit Booth at the annual meeting of the AMS, with the SICB

The contest is a memorial to Ralph Buchsbaum, pioneer in cell and tissue culture of animals and champion of photomicrography, and its aim is to encourage microscopical-biological photography. Contributions to the Ralph and Mildred Buchsbaum Fund are welcome. Income from the fund supports the prize. Please address inquiries to Dr. Vicki Buchsbaum Pearse, vpearse@ucsc.edu.

Contest Rules

1. There are separate categories for color and black-and-white photomicrographs.
2. Photomicrographs taken using transmission electron microscopy, scanning electron microscopy, and any kind of light microscopy, including confocal scanning laser microscopy, are eligible.
3. The contest is open to SICB meeting participants; up to 3 entries each. AMS membership is welcomed but not required.
4. Submissions must be prints, with maximum dimensions of 8 X 10 inches, unlabeled, unsigned, and mounted on poster board or foam-core mounting board. A single line of information identifying the subject (e.g., "Mouthparts of a mite") and stating the microscopical technique (e.g., "SEM") should be below the photograph.
5. Entries will be accepted on the morning of the first full day of the meetings (Thursday, January 5, 2006) at the AMS booth in the exhibit hall, where they will be displayed as a group. The deadline for submitting entries is before the exhibits close for lunch that day.
6. Voting begins on the afternoon of the first meeting day and ends before exhibits close at the end of the second full day (Friday, January 6, 2006). All meeting participants who visit the AMS exhibit are allowed one ballot for each contest category.
7. The winning entries in the color and black-and-white categories and entries awarded "Honorable Mention" will be determined by a tally of the ballots and will be announced at the AMS booth on the morning of the third day of the meetings (Saturday, January 7, 2006). The prizes will be awarded at the AMS Luncheon on Saturday, January 7, 2006. Contest winners are invited to the luncheon as the guests of AMS.
8. All entries must be reclaimed on the afternoon of the third meeting day, before the exhibit hall closes.
9. The author retains all rights to the entry. The author grants permission to AMS to publish the image in Invertebrate Biology and on the AMS website. If the image has been published previously, the author should obtain appropriate permission from the holder of the copyright.
CANDIDATES FOR ELECTED OFFICES

Following is biographical information on candidates for the offices of President-Elect for 2006, Secretary (2006-2008), and Member-at-Large (2006-2008).

For President-Elect for 2006


For Secretary (2006-2008)


For Member-at-Large (2006-2008)


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**President-Elect for 2006**

Judith Winston _____ Write-in* _____ Abstain _____

**Secretary (2006-2008)**

Stephen L. Gardiner _____ Write-in* _____ Abstain _____

**Member-at-Large (2006-2008)**

Michael Hart _____ John Zardus _____ Abstain _____

*Please be certain that your write-in candidate would be willing to serve in this position.

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You may return your ballot by regular mail to: Stephen L. Gardiner, Department of Biology, Bryn Mawr College, 101 N. Merion Ave., Bryn Mawr, PA 19010-2899 USA; you may also return your ballot by e-mail to: sgardine@brynmawr.edu. Although sender address will be present on e-mail ballots, a signature is not required. Information on all ballots returned will be held strictly confidential. Deadline for receipt of all ballots is December 30, 2005.