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EXPERIENCES - PROGRESS IN SCIENCE: SICB, RESEARCH AND PEOPLE

By Peter Wainwright, President-Elect, SICB

My experience as a member of our Society for Integrative and Comparative Biology has been highlighted by the way that the science and the people come together. The annual meetings and our journal function simultaneously as places to learn about the latest major results and new ideas, as well as forums for members to have their ideas heard before a broad audience of peers. Careers develop while the ideas and results are laid before us. There is no separating the science from the people.

Key ideas have come to me at SICB meetings. It was at a SICB meeting in the late 1980s that I met a graduate student from UC Davis named Ken Gobalet. Ken studied the complex and highly derived pharyngeal jaws of parrotfish and he showed me some schematic drawings



Lee Stocking Island, Bahamas in 2003. L to R: Ralph Turingan, Peter Wainwright, Justin Grubich and David Bellwood.

of what he had found, while we discussed his interpretations of how the jaws work. At the time I was studying pharyngeal jaws in much more generalized fishes but I just could not get my head around Ken's ideas about how the extraordinary jaws of parrotfish operated. This was a nagging issue for me because I recog-

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FALL LEAVES

By Billie J. Swalla, SICB President

Fall leaves! As the days get shorter, we step up our planning for the annual SICB meetings. The SICB Executive Officers met in West Palm Beach in early October to discuss many matters, including interviewing four stellar candidates for the Integrative and Comparative Biology (ICB) Editor. Stay tuned for the outcome of this international search!

ICB EDITOR SEARCH

Current ICB Editor **Hal Heatwole** has been improving the journal since 2006. Hal is well into his second five year term and will step down when his appointment ends in January 2016. Under Hal's leadership the journal has thrived and greatly increased in visibility and impact factor. Strong symposia have been published in a timely manner and we have a solid six issues a year being published.

THANK YOU HAL!!!

We thank the ICB Editor Search Committee, which was chaired by SICB past president Richard Satterlie, for their hard work in getting four excellent candidates for the ICB editor position. The committee consisted of Mike Alfaro, Alice Gibb, Sandra Shumway, Ian Sherman, and Peter Wainwright (SICB President-Elect). After interviewing four candidates, the SICB Executive Officers have put forward two individuals and are requesting feedback from the ICB Editorial Board as prescribed by the SICB By-laws. The Executive Officers of SICB will present a single candidate to the SICB Executive Committee for consideration and approval. Once approved, the new editor will be presented to the Society at the West Palm Beach meeting. The new editor will take over from Hal Heatwole in January 2016.

ON TO WEST PALM BEACH

We are very excited about the upcoming stellar, cutting edge SICB meeting in the wonderful West Palm Beach venue. Several hotels and wonderful shopping

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Support your favorite SICB fund. Click on the "donations" button on the home page.

BROADENING PARTICIPATION IN SICB

By Michele Nishiguchi, Chair, Broadening Participation Committee

Michele Nishiguchi, Brian Tsukimura, and Cheryl Wilga attended an invitation-only Broadening Participation meeting on September 14 and 15, 2014 at the FASEB campus in Bethesda, MD, sponsored by The American Physiological Society (APS), The Council for Undergraduate Research (CUR), and The Leadership Alliance. The meeting was facilitated by Brooke Bruthers, who is the lead co-PI for the NSF Broadening Participation-funded grant to the APS. The purpose of the meeting was to have the four currently funded BP grantees (CUR, APS, The Leadership Alliance, and The Society for Developmental Biology (DEB)) present their current ongoing work in broadening participation in their societies from the past two years. NSF Division of Integrative Organismal Systems (IOS) representatives were also present, and updated the group on funding opportunities that may be available next year for societies as well as other scientific groups. APS also invited other representatives from different scientific societies to get their feedback and also provide them with information on the types of programs that are being implemented at the undergraduate level to increase diversity within the societies.

Two invited speakers were at the



Cheryl Wilga and Brian Tsukimura meeting to give their insights for broadening participation. The first speaker was Dr. Clifton Poodry, who is a senior fellow in science education at the Howard Hughes Medical Institute. Cliff was previously the Director for the Department of Health and Human Services, Training, Workforce Development and Diversity at the National Institutes of Health. Cliff spent many years developing programs at the NIH to increase diversity in the biomedical workforce, and spoke about issues such as developing training, promoting institutional change, and leveraging diversity. These are key components that lead to a better environment for broadening participation. He suggested that societies should be

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WEAR A RIBBON AT SICB

Donations to the various funds of the SICB allow the Society to offer a superb program at its annual meetings and make this a student-friendly and family-friendly organization. At the 2014 annual meeting in Austin, Texas attendees sported different kinds of ribbons showing their support of SICB through their donations. This will be done again this year at 2015 West Palm Beach. Show your support!

Diamond >\$500
Platinum \$250-499
Gold \$100-249
Silver \$50-99
Bronze up to \$49



GREETINGS FROM THE SICB PROGRAM OFFICER

By Sherry Tamone

"I guarantee you that there will be something for everyone at the 2015 meeting in West Palm Beach and all four days will be rich with workshops, special sessions, evening special lectures, symposia, socials and science talks."

Fall is most definitely in the air! This is the time of year that becomes very busy for the SICB Program Officer as the abstracts to present at the 2015 annual meeting electronically arrive. My responsibility is to distribute all of the abstracts to the Divisional Program Officers who sort through them prior to arriving for the programming meeting in October. This is really where the fun begins!

The Program Committee met in West Palm Beach to see the venue and to organize almost 1500 abstracts into cohesive sessions. I guarantee you that there will be something for everyone at the 2015 meeting in West Palm Beach and all four days will be rich with workshops, special sessions, evening special lectures, symposia, socials and science talks. In addition to the oral and poster sessions, each of the four days will have three symposia (these are posted already on the meeting website (<http://www.sicb.org/meetings/2015/>) and on January 5th we will have two Special Sessions 1) Teaching Marine Biology and 2) Sally Woodin & Soft Sediment Ecology. Some of the workshops include topics on science policy, teaching and learning (TALX), and presentations from NSF officials. And on the evening of January 6, registrants can walk through West Palm Beach to explore the local pubs during our "Pub Crawl." You can sign up for this activity when you register or at the meeting.

We are meeting in January at the Palm Beach County Convention Center which is an excellent venue. It is spacious and well lit and session rooms are very easy to move between. **The convention center offers free internet throughout**, which is a benefit not often offered by other conference venues. There is not room for all SICB members to stay in a single hotel, but there will be shuttles running throughout the day that will pick you up at your hotel and bring you to and from the Convention Center. There are many restaurants that are within walking distance of the Convention Center for lunch and dinner.

There is also a FREE trolley system that will take you to more distant restaurant areas. I found that I could walk to most areas of interest in West Palm Beach, but that the trolley system was a great way to move around the more interesting areas of West Palm Beach. We will once again offer a "West Palm Beach Underground" that will provide you a local's guide to the best restaurants, pubs, and things to do. This will be available on the meeting website in December.

We will have a **SICB Meeting app** in place by the middle of December so keep an eye out for on the SICB webpage. Some members found the meeting app very helpful in organizing their desired talks and events. Once again, SICB will be offering childcare for members with young children. From past SICB meeting surveys,



West Palm Beach, Florida

we learn that our members with children appreciate this service greatly and without it would not attend their annual meeting.

Annual meeting attendees need to register by December 2, 2014 to obtain early registration rates. Hotels are filling up so if you have not made your reservations for lodging you should do so soon. You can choose from a list of SICB sponsored hotels <http://www.sicb.org/meetings/2015/travel.php>. SICB student members who receive SICB support will be staying at the Embassy Suites and will receive a free breakfast each morning and access to Happy Hour in the late afternoon. SICB sure knows how to take care of the students!

Another important role that the Program Committee performs at its October Programming Meeting is the selection of the symposia for the 2016 annual meeting in Portland. This year we had 18 very competitive proposals from which we selected

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West Palm Beach, Florida



www.SICB.org

SICB PROGRAM OFFICER

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12 symposia. The committee values the quality of the proposals but also reflects on the need to offer a balanced program. The selected symposia will be published in the SICB journal *Integrative Comparative Biology* after the Portland meeting. The following is a list of the symposia selected for the 2016 Portland meeting and a tentative schedule.

2016 Portland Tentative Symposium Schedule (January 3-7, 2016)

January 4

1 Neuroecology: Neural Mechanisms of Sensory and Motor Processes that Mediate Ecologically Relevant Behaviors

Organizers: Jeff Riffell and Ashlee Rowe; Sponsors: DAB, DCB, DCE, DEE, DNB, AMS

2 Life on the Edge: The Biology of Organisms Inhabiting Extreme Environments

Organizer: Annie Lindgren; Sponsors: DCPB

3 Parasites and Pests in Motion: Biology, Biodiversity and Climate Change (SICB wide)

Organizers: Christopher B. Boyko and Jason Williams; Sponsors: TCS, DEDE, DEE, DIZ

January 5

1 Extraocular, Nonvisual, and Simple Photoreceptors

Organizers: Thomas Cronin and Sonke Johnson; Sponsors: DCPB, DIZ, DNB, AMS

2 Building an Extravagant Toolbox: The Morphological Diversity of Intromittent Organs

Organizers: Brandon Moore and Diane Kelly; Sponsors: DCB, DCE, DIZ, AMS

3 Evolutionary Endocrinology: Hormones as Mediators of Evolutionary Phenomena (SICB wide)

Organizers: Robert Cox, Joel McGlothlin and Frances Bonier; Sponsors: DAB, DCE, DEDB, DEE, DPCB

January 6

1 Are Migratory Animals Super-spreaders Of Infection?

Organizers: Alexa Fritzsche and Bethany Hoyer; Sponsors: DAB, DEDE

2 Integrative and Comparative Biology of Venom

Organizers: Marymegan Daly and Lisle Gibbs; Sponsors: DCPB, DEE, DIZ, DNB, DPCB

3 Beyond the Mean: Biological Impacts of Changing Patterns of Temperature Variation

Organizers: Michael Dillon, Michael Sears, and Art Woods; Sponsors: DAB, DCE, DCPB, DEE, DIZ

January 7

1 A Bigger Picture: Organismal Function at the Nexus of Development, Ecology, and Evolution

Organizers: Sharlene E. Santana and Paul Gignac; Sponsors: DCB

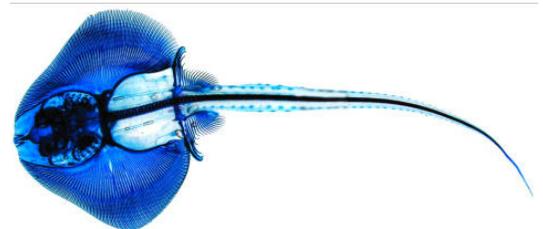
2 Tapping the Power of Crustacean Transcriptomes to Address Grand Challenges in Comparative Biology

Organizers: Donald Mykles, Karen Burnett, David Durica, and Jonathan Stillman; Sponsors: TCS, DCE, DCPB, DEDB, DIZ, DNB

3 New Frontiers in the Integrative Study of Animal Behavior: Nothing in Neuroscience Makes Sense Except in the Light of Behavior (SICB wide)

Organizers: Suzy Renn, Hans Hofmann, and Dustin Rubenstein; Sponsors: DAB, DCE, DEE, DNB

Plan to come to the 2015 West Palm Beach SICB meeting early to enjoy a few days at the white sandy beach or take a quick trip to the Bahamas before the SICB meeting starts. Being from Alaska, I will indeed come a bit early to relax, get over my jet lag, and swim in the Atlantic before the meeting.



From the DVM Researchers Database Adam P. Summers, Biomaterials, biomechanics and bioinspired design

SICB FINANCES - TREASURER'S REPORT

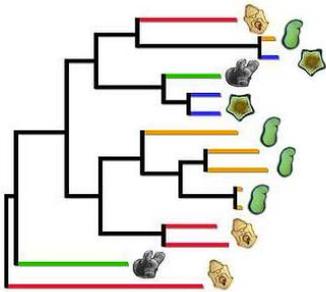
Karen Martin

The change to a new Member-Year starting on April 1 rather than January 1 has had some interesting effects on the Society. A large number of abstracts have come in for the Annual Meeting in West Palm Beach, but the number of members that have renewed their memberships is less than usual at this time of year. Please remember to renew your membership in a timely manner in order to keep current with the journal and with the other benefits of membership.

The Annual Meeting in Austin was successful on many levels. In particular the attendance, and the number and quality of talks were all strong. The preliminary results from the meeting indicate that the Society was able to operate in the black once again, with a small net of \$7,960 after all revenues and expenses are tallied.

The major sources of revenue for the Annual Meeting are the registration fees, at approximately \$340K. Exhibits provide an additional \$27K. With donations and other revenues, the total incoming funds were \$384,425. The major expenses for the Annual Meeting were the Projection and Sound contract at \$64K, the meeting management fees at \$59K, the coffee breaks that added up to a total of \$52K over 4 days, and the two society-wide socials at \$36K. The new meeting app software cost \$7K. With additional items, the total expenses were \$376,464.

Your Treasurer has made a major effort this year to examine all the named funds and their history within the endowments of the Society. With the help of the Executive Officers and Burk and Associates Inc. (the SICB management company), we have developed a new method for calculating interest and dividends for these accounts that should favor healthy sustainability and growth. New methods for reporting the financial details for each fund will also be implemented in order to allow more transparency for each fund and its use for awards. Details on the current balances for each fund will be provided at the Annual Meeting.



From the DIZ Researchers Database
Michael Hart, Population genetics of reproductive variation

SICB EDUCATIONAL COUNCIL

Bob Podolsky, Chair

The 2008 SICB member survey made clear that members are keenly interested in expanding the educational efforts of the Society. As outgoing chair of the Educational Council, I am taking one last time to highlight these opportunities and resources on education while showcasing features of the upcoming meeting in West Palm Beach.

TALX Workshops. At the 2013 meeting in San Francisco we initiated the "Teaching and Learning X" workshop series. Focusing on a different discipline each year, the workshop provides

a forum for current and future faculty to engage in hands-on activities and to share innovation. The TALX topic in WPB will be "Quantitative Biology" (see below). Recently, I noticed that another workshop (in Marine Biology) with goals of the TALX was organized for WPB without contacting the Educa-

tional Council. I want to emphasize that we are prepared to help with coordinating such workshops and we have a budget to contribute. **Watch for future calls for TALX proposals and consider organizing a TALX in your field.**

Alignment of TALX with Moore Lecture.

At the 2011 meeting in Salt Lake City, the John A. Moore education plenary was moved to be the capstone session of the conference. Each year of the TALX we have also managed to invite a Moore lecturer who complements (and has contributed to) the workshop. This year's Moore lecturer, Dr. John Jungck

(cofounder of the BioQUEST Curriculum Consortium, bioquest.org), once again complements the TALX. The TALX is being run as a hands-on extension of an education-oriented symposium on quantitative biology being organized by Drs. Laura Miller and Lindsay Waldrup. In addition, the meeting will feature a demonstration table

"The 2008 SICB member survey made clear that members are keenly interested in expanding the educational efforts of the Society."

SICB EDUCATIONAL COUNCIL

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by QUBES (<http://qubeshub.org/>), a project to foster quantitative biology education in collaboration with BioQUEST. This alignment of events has allowed us to create a true "education theme" for the annual meeting, which we hope will continue in future years. **Consider nominating a Moore Lecturer, and donating to the Moore Lecture fund, which has the lowest endowment of any fund in SICB.**

Morse Award. At the 2014 meeting in Austin we initiated the M. Patricia Morse Award for Excellence and Innovation in Science Education. With this award we also established the opportunity for the winner to write a feature article that will appear in the SICB newsletter (if descriptive) or will be considered for publication in the SICB journal ICB (if data driven). **Please consider nominating and honoring a colleague (or yourself!) for this prestigious award.**

Member education database. In 2011 we initiated a database of SICB education expertise, to be drawn from standard member information. To date, however, only a small percentage of members have contributed their teaching information. SICB is unique among professional societies for representing such a wide range of disciplines, and having this information will fuel not only informal exchange about teaching but also education initiatives like the TALX. **Please contribute to this database by updating your member information.**

Undergraduate poster display. In 2011 we initiated an arrival day display of student posters to highlight their contributions to science and to SICB and to give them a chance to meet and practice. Feedback about this event from students has been positive, but disorganization and spotty attendance have kept the event from fulfilling its goals. This year the Educational Council will more actively organize the display and help students to meet one another, but the success of the event depends on members visiting the area, which is close to the registration area. **Please support the students by stopping by the poster display.**

SICB Digital Library. Hope springs eternal! The SICB-DL has struggled for many years to establish sections with educational material beyond Biomechanics. In 2013 I fledged an Invertebrate Biology section with two small subsections, but the DL is still wanting for content across the diverse fields represented by SICB. **Consider becoming a subject editor for your division and taking the initiative to drive an increase in SICB-DL content.**

Alliance with other professional societies. We have helped in launching a new alliance of 23 professional societies, PSALSE (Professional Societies Allied for Life Sciences Education). Although just getting off the ground, this alliance will allow societies and their members to coordinate efforts in enhancing undergraduate education. Despite SICB's recent education initiatives, based on a recent PSALSE member survey we lag far behind other societies (many of which have paid education staff). I have found the work of other societies to be a great source of ideas for enhancing educational opportunities at SICB. **Please endorse increases in SICB financial support for such initiatives proposed by the Educational Council.**

Please contact the chair of the Educational Council (chair.edcouncil@sicb.org) with your interests and ideas, and help to continue growing the unique educational resources offered by SICB and its members. It has been a pleasure to serve as chair for the last 6 years and I look forward to serving SICB in other ways.



*From the Researchers Database
Robert Dudley, Hummingbird Archilochus colubris*

"Please contact the chair of the Educational Council (chair.edcouncil@sicb.org) with your interests and ideas, and help to continue growing the unique educational resources offered by SICB and its members. "



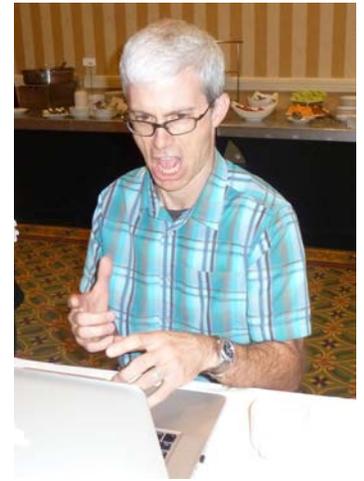
PROGRAM COMMITTEE - WEST PALM BEACH, FL



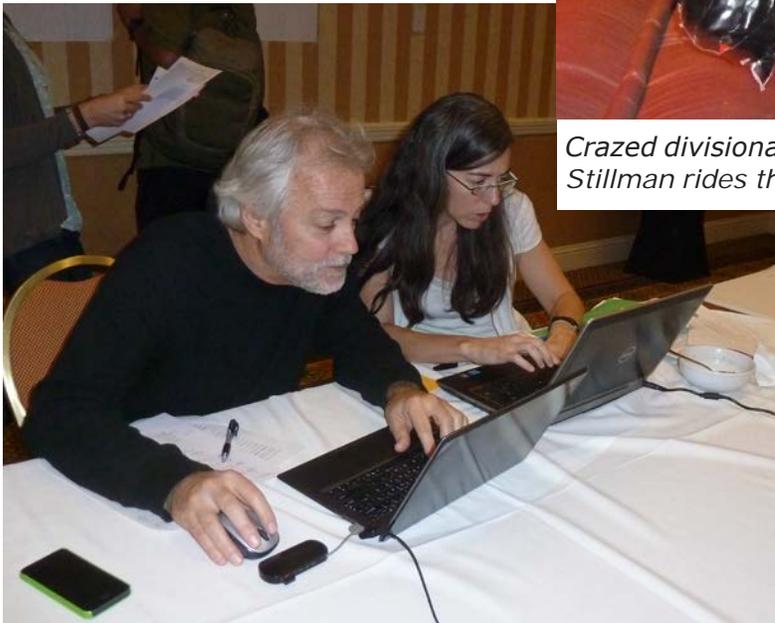
*Sherry Tamone,
Program Officer*



Crazed divisional Program Officer Jonathon Stillman rides the bull at West Palm Beach.



Jake Socha, Chair of the Public Affairs Committee, spots an abstract ripe for a press release!



Divisional Program Officers Chuck Derby (DNB) and Allison Welch (DAB) organize their sessions.



Allison Welch, Chuck Derby, and Rita Mehta work on the program.



Jennifer Rosenberg and Lori Strong of Burk and Associates Inc. provide excellent support to the Program Committee.



SICB Program Officer Sherry Tamone and the Program Committee arrange the program. Note the colorful charts in the background.

PUBLIC AFFAIRS COMMITTEE

Jake Socha, Chair

Student Journalism Internship Program

The Public Affairs Committee would like to remind members that the Student Journalism Internship Program will be running again this year at the annual meeting. This program provides students who are interested in science writing with a real-world science-writing experience at the SICB annual meeting in West Palm Beach. Each student will identify a talk or poster of their choice, conduct interviews, and write an original popular science piece that will be posted on the SICB web site. Between four and six students will be chosen. The Science Journalism Internship is a part of the Charlotte Mangum Student Support Program, and students must apply separately to both programs to be considered (see <http://www.sicb.org/meetings/2015/studentsupport.php>).

Science Policy Workshop at SICB 2015 in West Palm Beach

Want to get your voice in on the debate on science funding? Does your research have something to say that policymakers need to hear? This year's workshop on Science Policy Engagement, brought to you by the SICB Public Affairs Committee, will help scientists and science supporters in the SICB community better understand how science and policy intersect, how we are all empowered to make a difference, and how you can take your first steps toward making an impact on policy at the local, state, and national level.

BROADENING PARTICIPATION IN SICB

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focused on informing and educating their members on diversity issues by hosting workshops that influence or intervene with more traditional views on how to promote diversity. The second speaker was Dr. Mark Leddy, who is from the National Science Foundation, Division of Human Resources and Development. Mark spoke about broadening participation for people with disabilities, and has extensive experience in developing programs to educate the scientific community about inclusion of disabled people. He specifically mentioned that societies

need to create and implement inclusive diversity plans for their members, and engage members with disabilities so they can participate openly and without bias.

There may be an RFA announced next year, but it will be open to more than just societies alone, and will again be based on funds available through NSF-IOS. Cheryl (cwilga@uri.edu), Brian (briant@csufresno.edu), and myself (nish@nmsu.edu) will be keeping up on any news, so please send us any thoughts, suggestions, or insights that help us address issues for increasing di-

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*From the DPCB Researchers Database
Kerin Claeson, Chondrichthyes and Evolution of Vertebrate Morphology*

*See Page 4 for the
2016 Portland
Tentative
Symposium Schedule
January 3-7, 2016*

BROADENING PARTICIPATION IN SICB

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iversity within SICB. All three of us will be in West Palm Beach for the 2015 annual meeting, so pull us aside and give us your ideas.

The Broadening Participation Committee sponsors two workshops at each annual SICB meeting, based on suggestions from the Broadening Participation Travel Award applicants of previous years. The first workshop (noon, Jan. 4, 2015) that the BPC will be sponsoring at the 2015 annual meeting is "Oral presentation skills/science communication." This workshop is geared towards members who are interested in how to increase their skills in giving various oral presentations (job seminars, 3 minute elevator talks, meeting presentations, etc.). The second workshop (noon, Jan. 6, 2015) is entitled "Time management skills." This BP-sponsored workshop is meant to provide a toolkit to aid in time management skills. Presenters will provide information from direct experiences as well as information from previous committee work at SICB.

The Broadening Participation Travel Award call for applications has ended (October 1, 2014) and we had 29 applications. Travel Awards will be formally presented to recipients at the Broadening Participation Social during the annual meeting. So, be sure to come to the social and enjoy the refreshments while you chat with your SICB colleagues. We welcome the participation of all SICB members and look forward to hearing your comments and suggestions for broadening participation in our society.

Broadening Participation Events for the 2015 Meeting in West Palm Beach, FL:

1. Mentor-Mentee meeting hosted by Michele Nishiguchi.
Saturday, Jan 3rd, 6-7 PM.
2. Committee on Broadening Participation meeting
Sunday, Jan 4th, 7-8 AM.
3. Workshop - "Oral presentation skills/science communication"
Sunday, Jan 4th, Noon -1:30 PM.
4. Workshop - "Time management skills" hosted by Michele Nishiguchi
Tuesday Jan 6th, Noon - 1:30 PM.
5. Diversity Social hosted by BP committee
Wednesday night, Jan 6th at 8 -10 PM.



Michele Nishiguchi

**Member Benefit:
25% Discount on
Oxford University
Press Books**

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Home Page**

FALL LEAVES PRESIDENT'S REPORT, BILLIE SWALLA

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and dining areas are just blocks away from the Convention Center, which has a variety of big and small rooms to accommodate our ever-increasing numbers. Don't miss the keynote lecture by Ken Sebens, SICB Past-President!! Ken has been involved in several long term ecological studies and always has an engaging talk. We had about 1500 abstracts submitted for these meetings, so the Program Committee had its work cut out for them, but they worked tirelessly for two days to get everything arranged. We have some of the best symposia and symposium organizers to be found, and I would like to thank all of those involved in the effort, but especially our SICB Program Officer, Sherry Tamone.

This is the second year that we will do a pub crawl to get students acquainted with other SICB members and raise a bit of money. I attended this event in Austin and talked to many students who were first-timers at the meetings. Learning about their enthusiasm for science and for the SICB meetings was contagious. Consider paying for your graduate students to go on the pub crawl – it's a win-win for them and for SICB.

BE A SICB DONOR

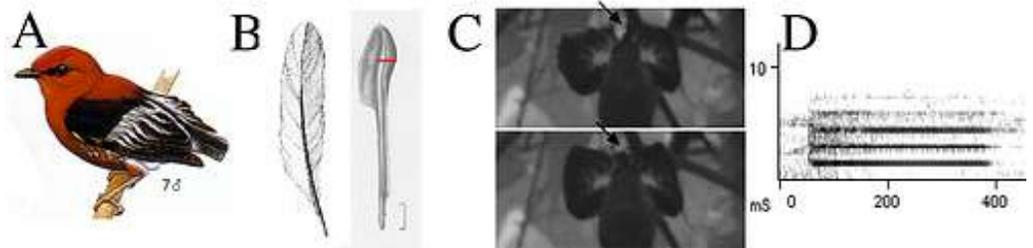
SICB is thriving and financially sound, but we are continuing to build our endowments so that the high level of support that students have experienced will be possible. We have been carefully

looking at our various funds and deciding whether to keep those that are not endowed to the \$25,000 mark. You'll be hearing more about this in the coming year. In the meantime, please consider giving some extra donations to your favorite fund when you renew your dues, even \$10 will help us in accomplishing our goals. Your contributions are carefully managed and used to support SICB activities, and we are grateful for them. We would like to concentrate on increasing donations to our **Moore fund** this year, in order to sponsor educational speakers and especially the Moore lecture. If you would like to get involved with this aspect of SICB, please let me know. We can use your help.

Thank you to the SICB officers who work tirelessly to make SICB and the meetings run smoothly. The better that we do our jobs, the less you notice, because it seems effortless. I feel privileged being involved with such a wonderful group of scientists and educators for my past two years as SICB President. I have truly enjoyed being at the helm of SICB and look forward to many more years of meetings as a Past President. It is humbling to see the awesome group I join when I step down. In January, I pass the baton on to Peter Wainwright who has taken on more responsibilities this year and is going to be a dynamite President. Thanks for the great memories!



www.SICB.org



*From the DEE Researchers Database
Kimberly Bostwick, How birds make sounds with their wings and how did it evolve*

EXPERIENCES - PROGRESS IN SCIENCE: SICB, RESEARCH AND PEOPLE - PETER WAINWRIGHT

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nized that there is probably no more important group of fishes on coral reefs where they make space available for corals by aggressively grazing algae covered rocks. Clearly the pharyngeal jaws are a key part of their success – they use the jaws to grind and pulverize a mixture of sand, algae, detritus, invertebrates and coral rock into a slurry which they then pass through their digestive system. But how do these jaws work? And, where did they come from?

Years went by before I got back to this problem but in the meantime I learned a lot about how pharyngeal jaws of other perch-like fishes operate and a key phylogenetic discovery by Mark Westneat and Mike Alfaro fundamentally changed the way we thought about the evolution of parrotfish. Following some tantalizing results from Howard Choat and Kendall Clements, in 2005 Mark and Mike published the first comprehensive, multi-gene phylogeny of labrid fishes and showed convincingly that parrotfish are phylogenetically nested within wrasses. In other words, parrotfish and their extraordinary feeding system evolved from the already very specialized pharyngeal jaws of wrasses. But, still I did not understand how these jaws worked and how they were different from other labrids and from more generalized percomorph fishes.

For me the parrotfish pharyngeal jaw light bulb finally went on in 1999 during a field trip to Lee Stocking Island in the Bahamas. I was with my colleagues David Bellwood, Ralph Turingan and Justin Grubich. We were there to collect labrid fishes for a study of functional morphological diversity of this group in the Caribbean. As anyone who does field work can attest, such trips can be great times for focused thought about science. And this group was totally focused on labrids, their functional morphology, their ecology and their evolution. As part of our col-

lections Ralph prepared several parrotfish heads for future anatomical study by doing partial dissections and drying them by repeated submersion in ethanol. It was while looking at these specimens, drying in the shade outside the lab, when parrotfish jaws finally began to click for me. Suddenly I realized that the huge, wing-like epibranchial bones act as stabilizers limiting lateral displacement of the highly

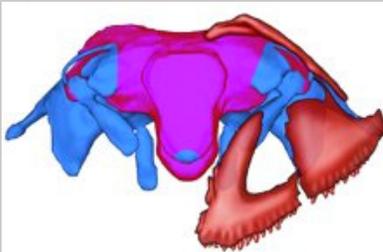
mobile upper jaw bones that slide anteriorly and posteriorly against a long curving joint on the underside of the neurocranium. It's easy to imagine when looking at pharyngeal jaws that most of the movement is in the lower jaws that are held out away from

the neurocranium, but the genius of the parrotfish system is that the movement is almost all in the upper jaws, undergoing long anterior and posterior excursions while being pinched between the lower jaw and the neurocranium. It is during these long excursions that food is pulverized. Somehow, parrotfish manage both a powerful bite and exceptional kinesis. I do not know any other jaw system in vertebrates with these properties. It is no wonder that they rule reefs.

When I returned from that trip to the Bahamas I went back to the paper Ken Gobalet had published from that 1988 conference (*American Zoologist*, 1989, 29:319-331). There it was. He had it all figured out! I just could not understand it until I really got a good look at the system in a real animal, and that was provided by Ralph's parrotfish dissections.

SICB brought me together with Ken Gobalet to get my first taste of parrotfish pharyngeal jaws, and it was at later SICB meetings that I learned much more about pharyngeal jaws from Justin Grubich's fabulous work with several other groups of fishes. I never would have understood the parrotfish system without the fantastic preparation that Ralph Turingan managed in the Bahamas, just one of many outstanding anatomical preparations that Ralph has made over the years.

“It was while looking at these specimens, drying in the shade outside the lab, when parrotfish jaws finally began to click for me.”



From the DPCB Researchers Database
Anne M. Maglia,
Evolutionary History of Organisms



www.SICB.org

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*Experiences - Part 17
in a series of
articles about the
research experiences
of members of SICB.*



EXPERIENCES - PROGRESS IN SCIENCE:

SICB, RESEARCH AND PEOPLE - *PETER WAINWRIGHT*

continued from page 11

This is an example of how SICB works. The people and the science. You meet someone at the annual meetings or see their talk and a window is opened into a fabulous research topic. Time goes by and other people use their own special skills and research to extend your insight. You make connections in the science and as new discoveries are made the entire context of the problem evolves into something new. Today we now know that parrotfish are a type of wrasse, and we know how their pharyngeal jaws work. We also know that all 100-odd species of parrotfish have remarkably similar pharyngeal jaws.

But new puzzles have also come to light. We now know that the rates of evolutionary diversification of their oral jaws are higher than in any other group of wrasses. This is highly unexpected. We associate diversification of the mechanical properties of jaws with ecological diversification. Other labrids feed on all sorts of small animals found on reefs, specializing on everything from zooplankton, to molluscs, foraminifera, fish, shrimp, crabs and even ectoparasites and coral mucus. And yet, different parrotfish species mostly feed on the same thing in very similar ways. Parrotfish show a tiny fraction of the dietary diversity seen in wrasses and yet the mechanics of their oral jaws evolve seven times faster than wrasses. Why? Speciation has also proceeded at an exceptionally high pace in parrotfish. Why?

These problems need a fresh look, perhaps some inspiration from someone with a new perspective at a SICB meeting! The parrotfish pharyngeal jaw is an extraordinary innovation that allows

these fish the unique ability to pulverize mouthfuls of algae, detritus and coral rock. But there is not much diversity in how the oral jaws procure these foods. David Bellwood has shown that some parrotfish dig deeper scars into the reef as they feed than others, but the vast majority scrape rocky surfaces overgrown by small plants and animals. Why then are there such high rates of diversification of the oral jaw mechanics and high rates of speciation in parrotfish, as compared to other labrids? The past 30 years has changed our understanding of parrotfish evolution and brought us an understanding of how their oral and pharyngeal jaws function, not to mention the vast increase in our knowledge of their ecology. But just when you think you have a handle on things, new results make it clear that there is more to the story.

Many of our research projects build over long periods of time in our career, with crucial input from colleagues at SICB meetings and key observations from other colleagues along the way. The science grows while careers grow and SICB provides that critical meeting place where one might seek out input from colleagues or just luck into a breakthrough idea while sitting



The parrotfish Chlorurus sordidus on a Red Sea coral reef (Photo by Andrew Hoey).

in a talk you weren't even sure why you were interested enough to attend. However the inspiration comes, I have found it many times in my career at our annual meetings. And while these are inspirations about science they always come from people. The science and the people, it's harder and harder to separate them.