2017 - VOLUME 29 ISSUE 2

ISBE Newsletter

Supplement to *Behavioral Ecology*
www.behavecol.com

CONTENTS

FROM THE NEWSLETTER EDITOR

Is there too much scientific controversy within our field, or too little? It probably depends on whom you ask. Robert Montgomerie declared "the end of Behavioural Ecology" in 2011, meaning it is now too large to be considered a single field. Still, at conferences it can appear that most of us know, or know of, most others. As we risk bumping into each other at the coffee breaks, we are perhaps hesitant to openly criticise each others' work or ideas. The lines of division that do exist may therefore be subtle and hard to detect for those merely listening to the presentations.

There are execeptions. During Stu West's plenary at ISBE in Perth 2010 he briefly mentioned "that Nature paper". A hushed noise went through the auditorium, and it made me sit up straight: Wow! a scientific controversy that I had missed! I immediately speed-read Nowak et al's (2010) eusociality paper, and enjoyed following the flurry of responses, symposia and debates it ignited. It can be envigorating when someone dares to openly criticise established theories or methods. I do believe open disputes serve a purpose. Even if your opponent would be dead wrong, the debate will force you to hone your arguments and make explicit how you define your concepts. One person not afraid of controversy was Amotz Zahavi, who sadly passed away earlier this year. For an obituary, see Clutton-Brock & Riley (2017), and also page 4 in this Newsletter.

On the other hand, isn't a display of unity a good thing? We live in a time when science is continuously attacked from the outside. The Internet has turbo charged all sorts of anti-science conspiracy theories - now even represented by top politicians. A within-field controversy can be hijacked by those rejecting science and used as an argument against science itself: "Look! they can't even agree amongst themselves, so let's ignore them". Perhaps there is a case for us to close ranks and to deemphasize disagreement. In his 2012 book *The geek Manifesto*, Mark Henderson demonstrates how effectively scientists can defend the scientific process and drive evidence-based policy - when they bury their hatchets and collaborate.

My belief is that we need to do both these things at the same time: defend science outward by highlighting consensus, while at the same time be brave enough to speak up when we disagree with our peers. It is all a matter of where and when.

One arena for intra-discipline debate is our Journal's Forum articles (Invited Reviews, Ideas and Commentaries) as well as the series of Virtual Issues. This Newsletter is also a place where we try not to shun controversy. An earlier editor told me of a heated debate that raged in here some years ago. Although it can become exhausting to be in the middle of such turmoil, we must not shy away from it. Of course, no one benefits from conflict for conflict's own sake, nor by personal feuds, but the Newsletter can be a forum for constructive criticisms of our current way of thinking and working.

P. Andreas Svensson,
ISBE Newsletter editor
Linnaeus University, Kalmar, Sweden
andreas.svensson@lnu.se

PS. Our books-for-review list on page 19 includes a potentially controversial book by Rui Diogo: "Evolution Driven by Organismal Behavior". I would enjoy seeing a review of it in a future issue of this Newsletter.

References

Clutton-Brock, T. & Ridley, A. 2017. Obituary: Amotz Zahavi 1928–2017. *Behavioral Ecology* **28**: 1195–1197.

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Montgomerie, R. 2011. The end of behavioral ecology - a review of: Westneat & Fox Evolutionary Behavioral Ecology. *Evolution* **65**:1212-1214.

Nowak, M. A., Tarnita, C., Wilson, E. O. 2010. The evolution of eusociality. Nature **466**: 1057-1062.

I S B E E X E C U T I V E

How to contribute to the Newsletter

The ISBE Newsletter publishes Book Reviews, Conference/Workshop Reviews, Job postings and other advertisements, as well as Commentary Articles of interest to the International Society for Behavioral Ecology. The ISBE Newsletter will only consider work that is not already published or intended to be submitted for publication elsewhere.

Book Reviews:. Persons involved in the publishing of books who would like these to be considered for review in the Newsletter should contact the editor so that they can be added in the books-for-review list. Authors may submit a list of possible reviewers. Members who wish to review a particular book should contact the editor. The editor will provide reviewers with instructions. Reviews are typically 1500-2000 words. For a list of books currently available for review, see the end of this Newsletter.

Workshop/Conference Reviews: Workshop and/or Conference reviews can be prepared in one of the following formats: *Brief synopses* (max 1500 words) and *Longer reports* (max 3000 words). Graduate students and postdocs are strongly encouraged to consider contributing to writing these reports.

Cartoons: Cartoonists and other artists are encouraged to submit artwork, either in hardcopy, or as TIFF or high resolution (>300 dpi) gif or jpg files. All cartoons published in the Newsletter will be credited to the illustrator.

Spotlight on young scientists: Early career members (PhDs/ postdocs) are encouraged to participate in the section "Spotlight on"; please provide name, education, current address, research interests and selected papers in an email to the editor.

ERROR IN BOOK REVIEW

The previous issue of the Newsletter featured a review by Clara B. Jones of Tim Clutton-Brock's book Mammal Societies. In it, Jones stated that only 64 of the book's references were to mainstream journals in ecology and evolution. After the Newsletter was published in March 2017, I was informed that this number was incorrect. Jones has now sent me the following statement:

This is an amendment to my review of Tim Clutton-Brock's Mammal Societies, published in ISBE Newsletter, 29 (1), pp 10-11. On page 10, paragraph 3, sentences 4 and 5 read:

> *The book is, to all purposes, a literature review of selected Natural History reports emphasizing publications by his own laboratory, by primatologists, and from the Old World. Of an estimated 5,300 references cited in the book under review, only 64 derive from mainstream journals in Ecology and Evolutionary Biology (N= 15 journals, including, Trends In Ecology and Evolution, American Naturalist, Journal of Theoretical Biology, Journal of Evolutionary Biology).*

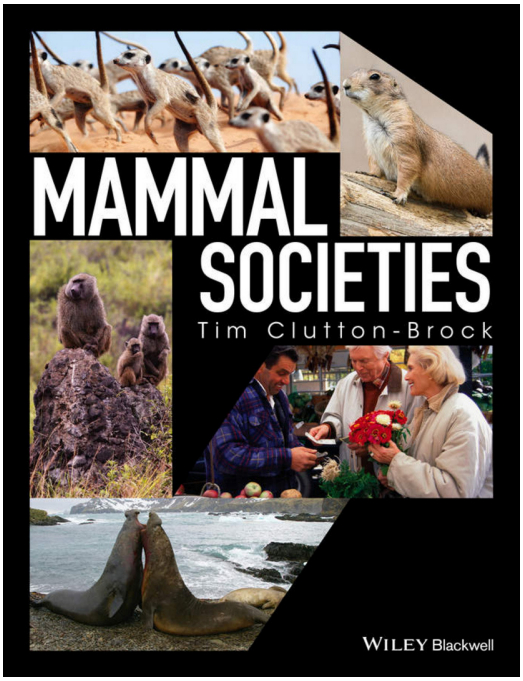
These sentences should be deleted.

This amendment does not affect the review as a whole. I apologize for any misunderstanding and am grateful to P. Andreas Svensson for editorial oversight and constructive criticism.

Clara B. Jones

Mammal Societies has 20 chapters, each containing between 158 and 442 references (mean: 267 per chapter). The vast majority are to peer-reviewed journal articles and book chapters. Many references are to behavioural journals, but a considerable number - serveral hundred - are to the type of journals that Jones wished to see more of.

In the review, Jones also called for definitions of the terms "aggregation", "social" and "cooperation" in the book's first chapter. A definition of cooperation is in fact present on page 24.



As editor I am sorry for not detecting this before the Newsletter was sent out.

I am of course very thankful to all who contribute to the newsletter, especially to those who spend long hours doing book reviews. Although all reviewers have a right to their opinion, factural errors are always unfortunate. I am grateful when they are pointed out to me so that they can be addressed in the Newsletter.

P. Andreas Svensson,
ISBE Newsletter editor

References

Clutton-Brock, T. 2016. Mammal Societies. Wiley-Blackwell, Oxford, UK. 760 p.

Jones, C. B. 2017. Mammal Societies - book review. *International Society of Behavioural Ecology Newsletter.* **29** (1), 10-11.

FROM THE PRESIDENT

Autumn 2017 sees our society in excellent health. Following the outstanding meeting in Exeter in 2016, our other raison d'être, *Behavioral Ecology*, goes from strength to strength. Under the dedicated and innovative leadership of the Editor-in-Chief, Leigh Simmons, the journal's leading role in our field continues, marked by increased usage and impact, and record ranking among journals on behaviour and ecology, but most importantly by the sustained quality of its publications. The transition to data archiving has operated smoothly, editing and production speeds are on target, and the new online platform introduced this year is a great success. Many thanks to Leigh and his editorial team, and to Cailin Deery, our new OUP publishing editor, for all their hard work. Among the recent initiatives are invited ideas and commentaries, which offer an excellent platform for debate (e.g. on the credibility of research in behavioural ecology earlier this year), and virtual issues on specific themes. The latest of these is on the Handicap Principle, which brings me on to the next subject I wanted to write about.

Amotz Zahavi

Amotz was a leading member of our society and a familiar face at ISBE meetings, so his death at 88 in May 2017 was a moment of great sadness for the many people that have been inspired by his work, have benefited from his teaching and enjoyed his company. Amotz was an ardent advocate of ideas that were often unconventional and controversial, but always thought-provoking. The debate that raged over the validity of his handicap principle at early ISBE meetings has become the stuff of legend, and it perfectly illustrated the contrast between his intuitive verbal reasoning based on detailed field observations versus a formal theoretical modeling approach, for which he had little time or interest. Nevertheless, his insistence that signals must be costly to be reliable is now fundamental to modern signaling theory. In contrast, his strongly held view that selection acted only on the direct fitness of individuals and that kin selection was a flawed concept, did not meet such a receptive audience, although that never stopped Amotz from forcefully arguing his case. He was perhaps at his most animated and passionate when talking about his long-term study of Arabian Babblers in the Negev desert; he continued to visit his study population of habituated birds long after his retirement "to keep up with the gossip", as he told me last time we met. A full obituary by Tim Clutton-Brock and Mandy Ridley, describing his life and diverse contributions to behavioural ecology and to conservation in Israel, was recently published as an editorial in the virtual issue on the handicap principle: https://academic.oup.com/beheco/article/28/5/1195/4176338/Obituary-Amotz-Zahavi-1928-2017

Membership

At the Exeter Congress in 2016, the ISBE Executive decided to move to 2-year membership from 2018 onwards. This change is being implemented in the current round of renewal notices for current members and for new members of the society who join in the run-up to the meeting in Minneapolis in 2018. The continuity provided by two-year membership has several advantages for the society and its members. First, it means that the usual dip in membership between conferences should disappear, so more of the behavioral ecology community has the opportunity to participate in elections of the president and of council members. Second, the number of renewal notices will be halved. Finally, by maintaining a larger membership and reducing costs associated with collection of society subscriptions, the subscription per annum is lower than it was previously. The various categories for subscription, with reduced rates for students, remain the same.

Finally, as we look forward to the next ISBE meeting in Minneapolis in 2018, I'd also like to remind members that the council is always keen to discuss potential future congress venues with anyone interested in helping to continue our rich tradition of exciting and inspiring conferences.

Ben Hatchwell
ISBE President

CONFERENCE CALENDAR

ASAB Winter Meeting 2017
December 7-8, 2017. The Association for the Study of Animal Behaviour Winter Meeting will be titled "Sexual selection: 30 years of testing the alternatives". www.asab.org/conferences

Göttinger Freilandtage
Dec 12-15 2017 in Göttingen, Germany. An international conference on primate behaviour. www.freilandtage.de

Nordic Oikos biannual conference
February 19-22 2018 "The importance of ecological science in society", in Trondheim Norway would like to welcome behavioural ecologists from all over the world
www.ntnu.edu/web/oikos2018

ASAB Easter Meeting 2018
Apr 4-6, 2018. The association for the Study of Animal Behaviour Easter meeting is organised by Dr Ben Brilot at University of Plymouth, UK.
www.asab.org/conferences

EHBEA conference 2018
Apr 4-7, 2018. The 2018 European Human Behaviour and Evolution Association conference will be held at the University of Pécs, Hungary. http://ehbea.com

HBES conference
July 4-7, 2018. The 30th annual Human Behavior and Evolution Society conference will be held in Amsterdam, Netherlands.
www.hbes.com/conference

Ichthyologist & Herpetologist meeting
July 11-15, 2018. The 2018 Joint Meetings of Ichthyologists & Herpetologists will take place in Rochester, New York, USA.
http://conferences.k-state.edu/JMIH-Austin-2017/about/future-meetings

ASSAB conference
July 12-14, 2018. Australasian Society for the Study of Animal Behaviour Conference, Brisbane, Australia.
www.assab.org

ICN 2018
July 15-20, 2018. The International Congress of Neuroethology will be held in Brisbane, Australia.
http://icn2018.com/

ISAE 52nd International Congress
July 30 - Aug 03, 2018. International Society for Applied Ethology meeting, Prince Edward Island, Canada. www.applied-ethology.org/isae_meetings

ABS 2018
August 2-6, 2018 The Animal Behavior Society annual meeting will be held at the University of Wisconsin-Milwaukee, USA.
www.animalbehaviorsociety.org

IUSSI 2018
August 5-10 2018, International Union for the Study of Social Insects, Guarujá, Brazil.
http://www.iussi2018com/

ECBB 2018
August 9-12 2018. The 9th European Conference on Behavioural Biology. Liverpool John Moores University, UK. www.ljmu.ac.uk/conferences/ecbb

ISBE 2018
August 11-16, 2018, International Society for Behavioural Ecology conference in Minneapolis, Minnesota, USA. More information on page 6.

Evolution 2018
August 19-22, 2018. The 2nd Joint Congress on Evolutionary Biology will be in held in Montpellier, France. The following societies are jointly hosting: the European Society for Evolutionary Biology, the American Society of Naturalists, the Society for the Study of Evolution and the Society of Systematic Biologists. http://evolutionmontpellier2018.org

IHSE 2018
The 2018 International Society for Human Ethology Congress will be held in Chile. http://ishe.org/chile-2018

Evolution 2019
June 21-25, 2019.The 2019 Evolution meeting will be in held in Providence, RI, USA.
http://www.evolutionmeetings.org

Behaviour 2019
Aug 2019, The 2019 joint meeting of ASAB and the International Ethological Meeting will be held in Chicago, USA. More information to be announced.

ESEB 2019
August 19 – 24, 2019. The next European Society for Evolutionary Biology meeting will be held in Turku, Finland. http://eseb2019.fi

ISAE 53rd International Congress
Aug 5-9, 2019. International Society for Applied Ethology meeting in Bergen, Norway.
http://www.applied-ethology.org/isae_meetings.html

ISBE 2018 CONFERENCE

August 11-16, 2018
Minneapolis, Minnesota, USA

On behalf of the organizing committee, I invite you to attend the 17th International Behavioral Ecology Congress (ISBE 2018). The meeting will be held at the Minneapolis Convention Center in Minneapolis, Minnesota, U.S.A., from 11-16 August, 2018. We will have an outstanding lineup of invited speakers from all over the world, as well as the usual contributed oral and poster sessions and, of course, the traditional soccer match. Our invited speakers include David Queller (Hamilton Lecture; Washington University), Rui Oliveira (IPSA-Instituto Universitário), Johanna Mappes (University of Jyväskylä), Karen Warkentin (Boston University), Regina Macedo (Universidade de Brasilia), Gene Robinson (University of Illinois), and Simon Laughlin (University of Cambridge).

Minneapolis, and its nearby sister city of St. Paul, are vibrant cosmopolitan cities (the "Twin Cities") with much to offer, and the surrounding area has unmatched opportunities for outdoor activities ranging from canoeing to hiking and backpacking. Meeting registration and abstract submission will open in early January 2018. Abstract submission and early registration at reduced rates will close at the end of March 2018. The conference web page should go live in early January 2018:
https://z.umn.edu/isbe2018

We look forward to seeing you in the Twin Cities in August 2018!

Marlene Zuk, local organizing committee chair

TRAVEL AWARDS FOR ISBE CONFERENCE 2018

Travel Awards for the ISBE conference in Minneapolis ISBE will once again offer travel awards to defray the expenses of attending our biennial conference.

There will be two types of awards: 1) Travel Awards, intended to help with transportation costs of Ph.D. students and post-docs (including recent Ph.D.s in temporary teaching positions); and 2) Developing Nations Awards, aimed at offsetting meeting attendance costs for students, post-docs or faculty whose home institutions are located in developing nations. Individuals must be current members of the society and have registered to attend the meeting to be eligible for funding. The opening and closing dates for award applications are currently planned to coincide with the meeting's early registration period, but stay tuned for updates. Awards will be distributed at the meeting as checks payable in US dollars.

Trish Schwagmeyer, ISBE Treasurer

FIELD HERPETOLOGY COURSE

Field Herpetology of the Southwest
The Southwestern Research Station (SWRS) is pleased to offer our annual workshop focusing on field herpetology 27 July – 5 August 2018 at the SWRS in Portal, Arizona, USA.

The course is designed for students, conservation biologists, and other individuals who have some background in biology at the college level. It will emphasize taxonomy, ecology, and field identification of reptiles and amphibians of southeastern Arizona and parts of southwestern New Mexico. The course will include lectures, field trips, and lab exercises. Collection of specimens during the course will be limited to instructors; no private collecting permitted.

Tuition for the 9 night COURSE is $1224 to be paid by all participants on being informed of their acceptance. Tuition covers fees for the course, and room and board at SWRS. The fee is payable to SWRS by credit card, certified check, or money order. Transportation costs between home and Tucson (air) or SWRS (auto) are to be borne by all participants; once the course is underway, most transportation is provided. As participants register, we will obtain email addresses and send them out to all participants so that they can arrange carpooling to and from the station.

The application form is available on the course web site (see below). If accepted into the course, fees are due by 29 June 2018.

For logistics or information about the SWRS you can contact:

Attn: Administrative Assistant
Southwestern Research Station
P.O. Box 16553
Portal, Arizona 85632
swrs@amnh.org; +1 520-558-2396

http://research.amnh.org/swrs/herpetology-field-course

Stephen Mullin

PODCAST WITH FOCUS ON BEHAVIOURAL ECOLOGY

In Situ Science is a new fortnightly podcast that showcases scientists and their research. Tailored towards scientists, science enthusiasts and students considering a career in science, each episode features a different scientist in a candid one-on-one interview. Scientists are given the opportunity to tell their stories about the discoveries the have made and what inspires them to do the research that they do. The podcast has a focus on behavioural ecology but covers all areas of science from Astronomy to Zoology. In Situ Science is available on all podcast subscription apps. Visit www.insituscience.com or follow @insituscience on Facebook and Twitter.

James O'Hanlon
info@insituscience.com

CONFERENCE REPORT

Small conferences are often the best. They provide unique opportunities for networking and meeting new colleagues, especially for students and are often more productive than the large meetings where participants are passing each other like ships in the dark. Such a meeting, the 7th Meeting of Poeciliid Biologists, was recently held at the University of Oklahoma in Norman with support from the OU Vice President for Research, the Department of Biology, and American Society of Naturalists. Previous meetings had been held in Europe and Trinidad, but this was the first time the group met in the US. A diverse group of well over 40 scientists from seven countries discussed a wide range of topics, including Behavior, Ecology, Evolution, Gene expression, Sex determination, Invasion ecology, Parasitology, and Morphology. Of the 38 presentations, students delivered 11. The common interest that all delegates shared was a taxonomic group: livebearing fishes or Poeciliidae. While many of the model organisms we use only cover a few aspects of biology, many different facets of biology are studied using livebearing fishes, like the guppy. This makes them a model family, with questions addressed ranging from Cancer research, Genomics, Sexual selection, to Community ecology.

The intent and purpose of the Poeciliid meetings has always been to bring together scientists that are united by using livebearing fishes, and exposing them to concepts from other disciplines.
This time the organizer provided a framework by invited noted scientists that reflected on viviparity in general (Dan Blackburn) and a comparison with a related group of fishes, Goodeidae (Constantino Macías García).

In addition, the participants held two roundtable discussions on the future of stockcenters and research in Mexico. The award for the best student paper was given to Kelly Wallace from the University of Texas at Austin.

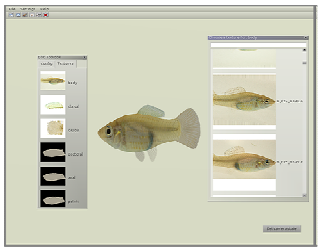
In the end, the meeting will be memorable for the many friendly discussions and the positive, happy atmosphere that prevailed. More information is available on the meeting website:
http://poeciliid2017.com/

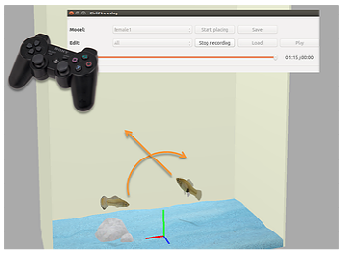
The organizers,
Ingo Schlupp
and Edie Marsh-Matthews

WORKSHOP REPORT

In October, Prof. Klaudia Witte's lab hosted a workshop at the University of Siegen Germany, called "Discovering FishSim in 3 days". The participants learned to use a series of programs, collectively called *FishSim*, which allow a biologist inexperienced in 3D animation to create computer animated fish for use as stimuli in experiments. We first used the program FishCreator to modify the appearance of existing 3D fish models. At the present, the team's animation experts have constructed sailfin molly and guppy models, but more species are planned. By pasting photographs of actual fish onto "UV maps" (which are folded-out 2D versions of the 3D polygon model), we could change, for example, the colors of the fins.

Once the model had the correct appearance it was imported into the program *FishSteering*, where we used a video game controller to steer the fish around a virtual tank and to record these movements.





Using the program *FishPlayer*, one or several such recordings could then be projected onto 1-2 screens.

Apart from the practical work with the software, we were taught the basics of computer animation and had many interesting discussions about the advantages, but also the limitations and challenges, of this approach to animal behaviour experiments.

Prof. Witte's team is currently working to implement all the experiences generated during the workshop into a updated version of the software. More information at the project's website:
https://virtualfishproject.wixsite.com/fishsim

P. Andreas Svensson
A happy workshop participant

RESEARCH POSITION IN ANIMAL BEHAVIOR

Smithsonian Tropical Research Institute

Staff scientist research position in animal behavior.

The Smithsonian Tropical Research Institute (STRI; www.stri.si.edu), headquartered in the Republic of Panama, is seeking an outstanding behavioral biologist to establish an independent world-class research program in animal behavior. The successful candidate will apply a deep understanding of natural history to resolve basic questions about behavioral mechanisms, evolutionary processes, and adaptive function. Areas of specialty may include, but are not limited, to behavioral ecology, evolution of behavior, sensory and neuroethology, chemical ecology of behavior, behavior developmental physiology and functional morphology, and the genetic basis of behavior. Candidates working on any animal taxa, marine or terrestrial, will be considered. Previous experience working in the tropics is not required. The successful candidate will have opportunities to mentor pre- and post-doctoral fellows drawn from an international community, and collaborate with the entire Smithsonian staff.

STRI has state-of-the-art research facilities, as well as terrestrial and marine field stations, and reserves throughout the country. There are environmental monitoring facilities, a large, multilingual support staff, and a library with extensive holdings in the natural sciences, as well as electronic access to all the Smithsonian libraries. The Republic of Panama and the adjacent regions of tropical America are phenomenally rich in terrestrial and marine habitats. The new staff member will join a vibrant scientific community of 30 staff scientists, and an international community of over 1500 scientific visitors per year, including fellows and interns supported through the Smithsonian. Staff scientists maintain diverse research programs covering ecology, evolution, physiology, development, and behavior of marine and terrestrial organisms and ecosystems, both ancient and modern, and the role of human interactions in shaping tropical environments. Staff scientists are not limited to conducting their research in or near Panama.

The position consists of full-time research. Internal funds are provided for laboratory setup, core ongoing research and travel. Staff scientists may supplement their basic yearly research budget by competing for additional intramural and external research funds. Staff scientists are evaluated on their research accomplishments. There is no official tenure, but rather a system of periodic reviews that allows for long-term research projects. For more information on working at STRI see the FAQ:

http://www.stri.si.edu/job-184/jobs_files/STRI_Staff_Scientist_FAQs.pdf

No formal teaching is required, but in addition to mentoring post-doctoral fellows, students, and interns, STRI scientists are encouraged to teach in graduate training programs with affiliated universities, and to participate in outreach to local and international audiences.

Early- to mid-career candidates are encouraged. Annual salary is commensurate with experience. Compensation packages are internationally competitive, and include allowances to support educational expenses for dependent children at international schools. The position is based in the Republic of Panama. Relocation expenses are provided.

Qualifications: A Ph.D. and post-doctoral research experience in a relevant field, an outstanding publication record, demonstrated success in obtaining research grants, a history of successful collaborative research, and demonstrated skill in communicating science to the public.

To Apply: Please submit the following as PDF files: a cover letter, curriculum vitae, statement of research accomplishments and interests in animal behavior and related fields, PDFs of three to five significant publications, and the names and contact information of three references to strisearch@si.edu. Address inquiries to Dr. Rachel Page, Chair, Animal Behavior Search Committee, at PageR@si.edu.

Positions are open until filled; review of applications will begin on November 15, 2017 and interviews will commence shortly thereafter.

STRI is an equal opportunity employer and is committed to diversity in its workforce. Appointments are made without regard to nationality. In addition this position in animal behavior, STRI is currently filling staff scientist positions in terrestrial microbial ecology, forest biology and marine biology, and is supportive of the needs of dual career couples. For more information on the positions STRI is offering, please see our webpage:

www.stri.si.edu/recruiter/users/jobs.php?id=184

ABS MEETING SYMPOSIA SUGGESTIONS

The 2018 Animal Behavior Society meeting will be held August 2-6, at the University of Wisconsin-Milwaukee, USA.

We now invite applications for an innovative symposium called:

"Research questions that we should be asking".

Presenters will outline their view of an important topic on the evolution and/or ecology of behavior that is being neglected by current research. Do you think a topic is being neglected because it is deemed too risky by the traditional 3-year grant system? Or because we have not yet grasped its importance? This is a chance to bring attention to it.

Each presentation will last 20 min, with another 10 min for questions from the audience. The last session will be a 20-min round table discussion among the presenters, with 10 min for questions from the audience.

Following the symposium, we will conduct a crowd-funding exercise, with audience members voting with dollars for the most interesting idea. The top two ideas will share the funds gathered.

To apply, submit a title and abstract (<250 words) describing the topic that you wish to address at the symposium in an email to rafa@uwm.edu with the subject heading "unasked". We will select applications on the basis of interest and insight (not risk), aiming to have 4-6 presenters for the symposium.

Rafael L Rodriguez Sevilla
rafa@uwm.edu

NEW ADDRESSES

Dr. Alan McElligott

New position:
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Dr. Adam Reddon

New address:
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School of Natural Sciences and Psychology

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adam.reddon@gmail.com

LIVERPOOL JOHN MOORES UNIVERSITY

BEHAVIOR METHODS DVD

The Methods of Behavioral Research DVD tutorial produced by the Association of Zoos & Aquarium's Behavior Scientific Advisory Group is still available for purchase.

The tutorial covers all the steps of the behavioral research process from literature review to basics of data analysis. The content is presented at the undergraduate level but certain chapters may be useful for high school students as well as graduate students new to behavioral research.

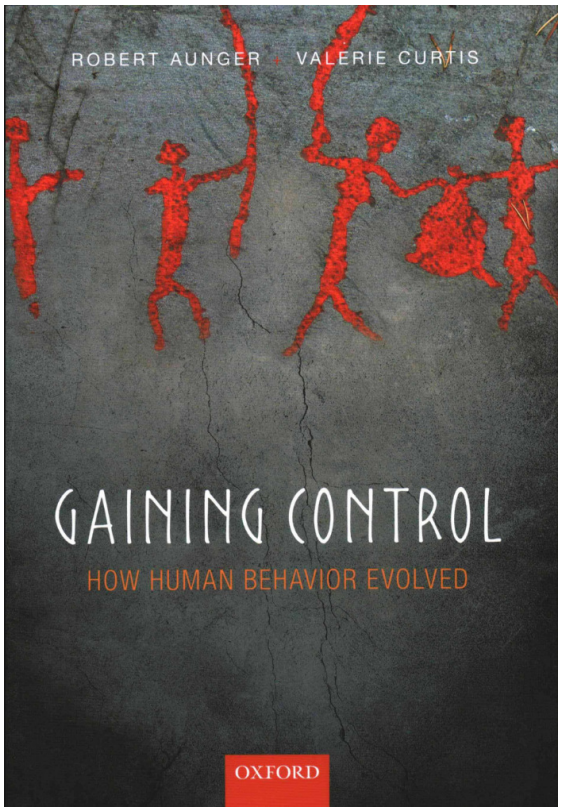
Detailed content, video samples, and ordering information are available here:
www.aza.orgmethods-for-animal-behavior-research-dvd

David M. Powell
dpowell@stlzoo.org

Gaining Control: How Human Behavior Evolved

Robert Aunger & Valerie Curtis

Oxford University Press. 2015. 176 pp.
ISBN: 9780199688951 (hardback)



From cooperation to culture and language, the many putative elements of human uniqueness form a thriving (and often highly debated) focus of research. One less-studied element is the large behavioral repertoire that humans exhibit relative to other animals, and its remarkable flexibility. Aunger and Curtis' key point is that humans have the ability to plan and execute behaviors over much longer time horizons than do other animals, thus allowing them to ignore current payoffs in favor of future ones. This, the authors argue, is an important evolutionary innovation (or series of innovations) that has allowed humans to "gain control" over their environment. In this short book, Aunger and Curtis take a primarily phylogenetic approach, describing the hypothetical steps by which human behavior became more complex and flexible. They suggest that each of these steps is a new "behavioral production unit" (BPU) that constitutes not only a fundamental category of behavior, but also a major "neural transition" analogous to the major evolutionary transitions.

The authors focus on one mechanistic component of behavior: "What lets animals turn salient external and internal stimuli into adaptive outputs, or behavior, are accreted brain mechanisms which we call BPUs." The first section of the book lays out a classification schema for these BPUs. Beginning with their central question of how behavior is controlled, the authors suggest that BPUs can be categorized according to three levels of control: the reactive system, which responds immediately to environmental stimuli; the motivated system, which incorporates internal states and external stimuli to produce behavior over a longer time span; and the executive system, which allows for complex chains of possible future events. Orthogonal to these levels of control are three types of evolutionary benefits that behavior can confer. The authors define these according to how they bring about an improved end-state for the organism: physiological, or the gain of benefits themselves; situational, by allowing the organism to change its relationship with its environment to make the future gain of benefits more likely; and aptitudinal, where the organism can increase its own ability (e.g. cognitive) to gain benefits in the future.

The authors' framework for analyzing BPUs is thus a matrix of these three levels of control and three types of functional benefits. The second section of the book populates this matrix with candidate BPUs and details the hypothetical sequence in which these BPUs evolved in the human lineage. Starting with the emergence of behavior itself – that is, the evolution of active locomotion from passive motility – in unicellular animals, the authors suggest that first BPUs to arise were those at the reactive level of control: reflexes (to improve physiological end-states) and exploration (to improve aptitudinal end-states) in bilaterian animals, and instincts (to improve situational end states) in protostomes.

The subsequent evolutionary step was the emergence of motivated BPUs in early vertebrates: drives (to improve physiological end-states) and interests (to improve aptitudinal end-states). To improve situational end-states, reptiles and mammals evolved ecological and social emotions respectively. The evolutionary sequence concludes with the executive BPUs: planning, which improves both situational and physiological end-states. The authors suggest that the first planning BPUs arose in higher primates and were implicit or unconscious; the ability to construct explicit or conscious plans is unique to humans, who can reflect on their own mental processes.

The third part of the book presents two implications of the authors' BPU framework. First, they propose that BPUs are a fundamental unit of analysis, corresponding to the philosophical concept of "natural kinds". (An illustrative example for behavioral ecologists is that shared selection pressures create phenotypes with similar features; these would be evolutionary natural kinds.) The authors are agnostic about the brain structures that underlie BPUs, but point out that this does not challenge their assertion that BPUs are natural kinds: after all, the existence of atoms and genes was deduced before these fundamental units were empirically identified.

The authors' second proposition is that the emergence of new BPUs is a set of major neural transitions: "specific changes in the way animals learn and store knowledge about the world and themselves". They outline how the major evolutionary transitions comprised changes in how information is stored, translated and transmitted between generations (Maynard Smith and Szathmáry 1995): for example, from RNA to DNA, and from genetic information to cultural information. Their bold claim is that neural transitions comprised changes in the storing, translation and transmission of information within individuals, and they outline how behavioral systems can be seen as analogous to genetic systems (while genes produce proteins, neurons produce behavior; behavioral "inheritance" constitutes the consolidation of memories within neural tissue). In addition, just as evolutionary transitions brought about new divisions of labor and levels of organization (Queller 1997), so too did the neural transitions: functional transitions allowed animals to reach new end-states, and organizational transitions allowed new levels of control.

In the book's final section, the authors reflect on implications of their classification schema for both pure and applied research. They point out its utility in facilitating interdisciplinary communication, and then highlight three fields for which it has particular potential to advance inquiry. First, it could provide a theoretical framework for neuroscience to identify, test hypotheses about and compare brain structures (e.g. those that underlie BPUs) across species. Second, comparative psychology could use the authors' schema to help resolve disputes about the cognitive sophistication of non-human animals. Third, it can provide insights for the applied behavioral sciences, which is the authors' own field; they give a couple of interesting examples from their work on public health, such as triggering disgust responses to promote handwashing. I agree with their "Eco-Evo" or "Darwinian approach to behavior change" (Aunger and Curtis 2014) – that only by understanding how behavior works can we figure out the tools we need to change it – but I still do not fully see what the levels of control approach contributes that a Darwinian approach currently lacks.

This is a thought-provoking book that, with its blend of phylogeny, mechanism and function, touches on issues that are relevant to behavioral ecologists but that many of us do not regularly consider. For example, the book asks and attempts to define what behavior itself is in the first place; even animal behaviorists, let alone researchers from other disciplines, do not agree with each other on this issue (Levitis et al. 2009). Although it ends with a call for a Darwinian approach, the book does not really take a behavioral ecological perspective, and I found its message about function somewhat confusing; while there was a welcome mention of the levels of analysis (Tinbergen 1963), it came late in the book and seemed to imply that function was about ecology and not evolution. Whether the authors' claims about phylogeny and mechanism are valid I will leave to researchers in those fields to examine, but I laud the authors' emphasis on providing testable predictions, and I think their hypotheses will stimulate interesting discussions among readers, if not also exciting future research.

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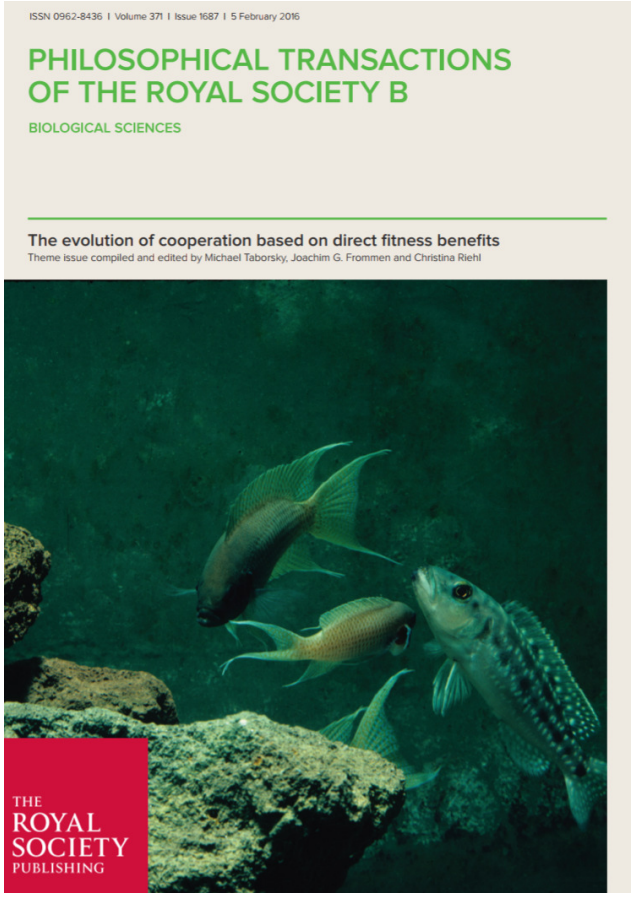
The evolution of cooperation based on direct fitness benefits

Edited by: Michael Taborsky, Joachim G. Frommen and Christina Riehl

A Theme Issue of The Philosophical Transactions of the Royal Society B Biological Sciences. February 2016; volume 371, issue 1687)



The Philosophical Transactions of the Royal Society B's Theme issue "The evolution of cooperation based on direct fitness benefits" reviews, investigates and questions the current paradigm of the evolution of cooperation. This issue offers a necessary synthesis of the mechanisms that promote the evolution of cooperation between unrelated individuals and the evolutionary stability of such cooperation. This issue assembles an immensely useful collection of theory, models, concepts, approaches and insights on the topic of cooperation based on direct fitness benefits. The first six articles cover novel theoretical, modeling and conceptual considerations, the next eight are structured according to animal cooperation based on direct fitness benefits, and finally the last three articles present a human perspective. The articles are designed to be read independently of each other. A particular strength of this issue was that each article integrated in-depth reviews while pinpointing outstanding difficulties and/or mis-conceptions that are currently held.

The body of knowledge concerning the mechanisms that promote cooperation between unrelated individuals and the evolutionary stability of such cooperation is still very much a body of knowledge in works. The study of cooperation between unrelated individuals is not new, however the study of the evolution of cooperation based on direct fitness benefits has received less attention than kin selection theory. This field of study has made researchers reconsider the general belief that the evolution of cooperation in social groups is primarily driven by the indirect fitness benefits derived by cooperation between related individuals. This issue will make readers want to reconsider other widely-held assumptions and methods, such as the assumption that the quantification of direct fitness benefits of cooperation can be safely ignored, the use of idiosyncratic assumptions in evolutionary models of help, and the assumption that punishment is an evolved response to cheating.

In the first article, Akçay and Van Cleve envision inclusive fitness as classical Darwinian fitness, averaged over social, demographic and environmental states experienced by a gene lineage. Readers will find this article thought provoking. The authors described important misconceptions held in regards to inclusive fitness. Empiricists whose definition of inclusive fitness is limited to Hamilton's inclusive fitness and who emphasize that inclusive fitness is only an individual level quantity will be greatly stimulated by this article. In the second article, Quiñones and colleagues use a simulation modelling approach to assess negotiation-based strategies over different levels of kin structure. The results help to further clarify the interplay between kin- and negotiation-based mechanisms on the evolution of cooperation. Their analysis revealed that negotiation strategies in the absence of a kin-structured population lead to an equilibrium where subordinates appease dominants by conditional cooperation with high levels of help, whereas kin-structured populations lead to an equilibrium where subordinates provide unconditional help to kin at lower levels than in non-kin structured populations.

In the third article, Johnstone and Rodrigues introduce ecologists and evolutionary biologists to a useful economic model for the assessment of the impact of investment in the public good to study how selection may favour efficient distribution of resources between unrelated individuals. The model's findings and its application to a sequential biparental care game between parents reveal that when each member of a group invests in the public good there should be no conflict over the distribution of resources, because those claiming a latter share also take on a greater burden of investment in the public good. In the fourth article, Schonmann and Boyd derive a rule to determine the required relatedness threshold for contingent

cooperation in n-person iterated games to further our understanding of when rare cooperative strategies can increase. They emphasize that finding persistant cooperation is insufficient, and that research should additionally seek to explain why contingent cooperation is a likely evolutionary outcome. Their rule reveals that rare strategies that support mutually beneficial cooperative behaviour increase only in groups that assortatively form and that relatedness is key to the evolution of cooperation.

In the fifth article, Barta investigates how inter-individual variation and variation in other traits influence assortment, thus influencing the evolution of cooperation. Results revealed that changing the within-population variation of a trait altered the social networks, which generated different inter-individual preference curves and influenced the evolution of cooperation. Barta provides an overview of selected models to address how random processes like mutation and phenotypic noise, individual state differences, social ties and individual role specialization cause inter-individual variation to arise. In the sixth article, Rodrigues and Kokko review models of social evolution and the evolution of helping. The authors pinpoint two questions that models should address and categorize models based on who help whom and what is achieved with the help received. The authors address how their proposed categorization of models reveals pitfalls that affect our ability to agree on which types of help are predicted to evolve most easily and provide a useful outline of future directions.

In the seventh article, Taborsky and colleagues emphasize the importance of correlated pay-offs to the evolution of cooperation and pull together examples of reciprocity between unrelated individuals across a wide range of taxa. The authors readdress the different forms of reciprocity and when reciprocity should be evolutionary stable. The authors review the predicted conditions that select for reciprocity and address the costs, the benefits and several factors that influence the probability of receiving help in the future for given help. Taborsky and colleagues also review the factors that constrain reciprocity and focus on cognitive abilities and time-lags between cooperative acts. In the eight article, Wilkinson and colleagues review examples of mutually beneficial acts in bats among unrelated individuals and ask whether these acts are the result of by-product mutualism or costly cooperative investments open to exploitation. This review highlights that evidence of costly cooperative investments among unrelated bats is relatively rare, however few bat species have been studied in detail and increasing the length of studies may reveal that the time frame for the receiving of direct fitness benefits for given help is longer than currently assessed.

In the ninth article, Field and Leadbeater address why *Polistes dominula* foundresses nest with unrelated individuals and participate in the costly rearing of the dominant female's offspring given that independent nestling is also observed. This review clarifies that the inheritance of the dominant position greatly increases the direct fitness of the foundress compared to independent nestling. The authors provide an overview of the behavioural differences between related and unrelated subordinate co-foundresses. Field and Leadbeater points out that the role of recognition errors should be investigated to assess the process of assortment of unrelated co-foundresses. In the tenth article, Gadagkar calls for an assessment of the necessity of Hamilton's rule and for the use of other creative, non-conventional ideas, such as the careful consideration to individual selection, group selection and integrated multi-level selection approaches. Gadagkar questions the genetic, ecological, physiological and demographic predisposition of workers compared to single foundresses to the evolution of eusociality. The author describes the empirical evidence of eight phenomena that suggests that the social organization of the primitively eusocial wasp *Ropalidia marginata* may be under selective forces other than kin selection.

In the eleventh article, Bshary and colleagues argue that assumptions of maximal conflict, such as in iterated prisoner's dilemnas, and minimal conflict, such as in by-product mutualism and positive pseudo-reciprocity, are unstable in nature, whereas intermediate levels of conflict are more likely in nature. Due to the instability of these two extremes, the authors propose shifts from these extremes to intermediate levels of conflict in nature. The authors point out the discrepancy between the theoretical findings and empirical evidence and provide an overview of arguments for the discrepancy, such as the cognitive constraint hypothesis. In the twelfth article, Riehl and Frederickson review the literature on cheating and punishment and question the frequency of occurrence of both strategies and whether punishment evolved as a precondition to evolution. The authors conclude that cheating and punishment are probably rarer than often supposed. The authors align themselves with Cockburn's proposition that researchers may further the investigation of when cooperation evolves by thinking of punishment as a precondition for cooperation instead of as an evolved response against cheating to maintain cooperation.

In the thirteenth article, Hammerstein and Noë provide an overview of biological market theory and provide examples of trade in nature between species and between members of the same species that support the biological market theory. The authors clarify how biological trade in non-humans can be self-stabilizing. The authors describe concepts to consider for the study of trade-like cooperation that make biological market theory a very useful approach. In the fourteenth article, Platt and colleagues review the proximate mechanisms underlying social cognition in the primate brain by discussing empirical results in cognitive and systems neuroscience. The study of the cognitive mechanisms underlying cooperation and sociality in primates is an understudied aspect

of physiology that plays a critical role in aspects such as in the evaluation of the value and status of social partners and for the understanding of the cognitive and neural boundaries of cooperation.

In the fifteenth article, Silk and House provide an overview of three hypotheses to account for the evolution of cooperation and altruism in humans. Their comparative approach explores the form, scope and scale of altruistic social preferences in humans and closely-related primate species. This articles paves the path for a phylogenetic study of prosocial behaviour in primates to help clarify whether the evolutionary causes of cooperation are the same across in humans as in other animals and social preferences are shared with closely-related primates. Such a study could also assess whether the form, scope and scale of cooperation and altruistic social preferences in humans is the result of convergent evolution with other primate species or derived traits. In the sixteenth article, Milinski reviews the role of reputation as currency in human interactions. The author presents arguments that an individual's reputation can act as a currency when the individual needs help and provides useful examples of how humans and institutions can gain a good reputation. Milinski also describes how reputation can help solve the tragedy of the commons when public good games are played with the rule that a good reputation is required to gain money.

In the seventeenth article, Powers et al. build a complex, multi-level model to discuss the human transition from small-scale human societies based on kin structured assortment and trade to large-scale societies composed of institutional division of labour and cooperation among unrelated individuals across geographic boundaries. The authors propose a novel model that emphasizes the human capacity to negotiate institutional rules as a mechanistic driver of this transition and describe language and agriculture as key drivers of the sub-transitions.

In concluding this review, this issue makes a strong case for the value of conducting research on the evolution of cooperation based on direct fitness benefits and identifies research areas which might hold promising advancement for the study of the evolution of cooperation. This issue provides a nice overview for those new to the topic, and specialists in one of the areas covered should gain insights and find innovative research ideas from the articles' opinions and reviews. Surely, much research will be generated from the ideas presented in this issue in the coming decade, as it promises to spark interest in the investigation of the evolution of cooperation based on direct fitness.

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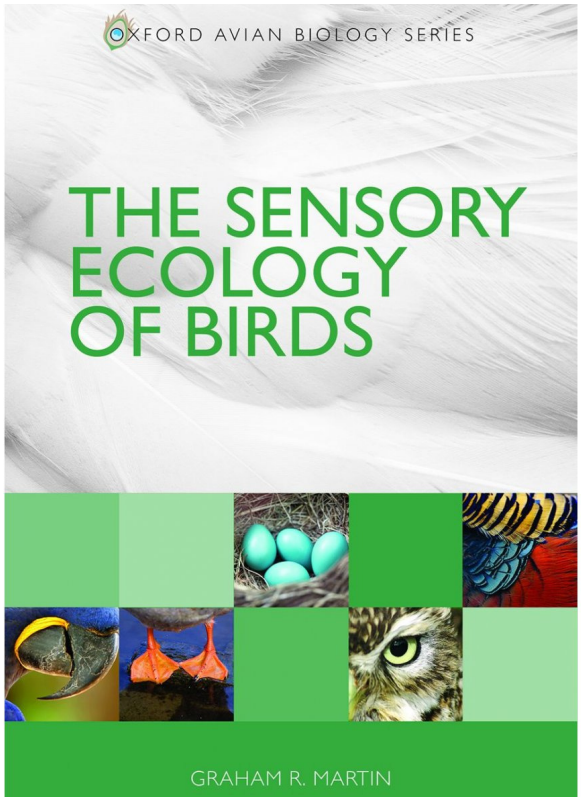
The Sensory Ecology of Birds

Graham R. Martin

Oxford University Press



During our formative years, many of us were told to "become our study organism" to understand their sensory world. Foster (2016) went to extremes to achieve this, but conceded that one is unlikely to ever completely get there (CBC Radio 2017). Perhaps it was a similar craving that plunged me into reviewing Martin's book amidst banks of deadlines. If you teach or study ornithology, you would find much that is familiar here (e.g., asymmetrical owl ears) but likely many surprises as well. Specialists in the fields of vision would likely learn the least from this book, but they may learn something about the other senses of birds.

First, some general comments. I found the odd typo and occasional passages that I had to reread to understand; not worth quibbling over. There is some repetition and I found some explanations (e.g., cyclopean fields) a little confusing, but overall, the message emerged clearly. There is an interesting array of illustrations, some of which are dwarfed by their captions! The text is full of interesting tidbits: Displacements of air molecules that cause sound are the diameter of an H atom. In the early 1700s, Sir Isaac Newton pointed out that color is not a property of the world, but of a visual system. I learned that vertebrates other than birds have foveae.

Chapter 1 reviews historical and philosophical developments in the study of avian senses. Some of this information seemed unnecessary, but some will find it of interest.

On to the workings of birds' sensory apparatuses. Trade-offs underpin much of Martin's approach to getting inside birds' heads, an approach I appreciate because it forces one to think about constraints. Martin begins by pointing out that ornithologists have long been able to characterize non-sensory structures of birds and figure out what they do. With sensory structures, it is much more challenging to understand their operation, particularly if the structures differ significantly from those of humans. Accordingly, Martin frequently points out how limited our understanding of avian perception continues to be.

It is no surprise that Martin's book focuses on vision, starting in Chapter 2. The "camera eye" of all vertebrates evolved 500 million years ago during the Cambrian explosion; this key event enabled spatial perception, and was an enormous improvement over simple light-sensitive organs found in a much broader array of organisms. Colour evolution was a later adaptation that significantly improved spatial perceptions. Only four orders of birds have true ultraviolet vision; this includes the largest order, Passeriformes, but surprisingly not corvids (jays, crows, etc.). Unlike mammals, birds rely on coloured oil droplets atop their cones to discern colors. Rock pigeons have more red oil droplets in the lower part of their eyes and more yellow in the lateral and upper parts, presumably adaptations to detect important stimuli in the correct locations. Martin indicates that no one has properly tested this. The importance of vision to birds is intuitive, and is reflected in the size of the brain areas devoted to it. And to some extent, their eyes are slightly superior to those of mammals, but not to the extent often believed. One improvement is that they don't have blood vessels in the eye that interfere with images; a pulsing pecten substitutes as the nutrient-provider for the relevant tissues [probably my favorite article title (Pettigrew et al. 1990) is sadly not cited in the book]. Moreover, there are aspects of avian vision that are inferior to those of mammals, such as contrast sensitivity.

Martin considers trade-offs among spatial resolution, colour perception, and light sensitivity. For example, resolution decreases with low light. Birds that evolve eyes that can work in low light cannot resolve fine detail in strong light. All in all, I thought this section was a good intro to bird and vertebrate vision, but I would have liked some comparisons with cephalopod eyes.

Chapter 3 reveals that hearing is not as well developed in birds as it is in mammals, and Martin attributes this partly to having only 1 versus 3 inner ear bones. Understanding the extent of avian hearing has mostly been based on training birds or monitoring nerve activity. Both are time-consuming, and to different degrees invasive, which limits our knowledge of this sense. We have learned that rock pigeons can detect sounds as low as 1 Hz using a Pavlovian model wherein mild electrical shocks to the

heart were paired with sounds; eventually heart rate increased when sounds were produced in the absence of shocks. By some accounts, a pigeon in the middle of North America would be able to hear waves crashing on both coasts. Although the range of frequencies that most birds hear is roughly comparable to that of mammals, I was surprised to learn that birds' abilities to discern the direction of sounds could be off by 20° to 180°! Martin attributes this to the relatively shorter distance between the ears, and the thinner skulls, both of which limit Doppler information. Birds' sense of distance to a source of sound is equally unimpressive. These interesting facts seem counter-intuitive given the demands imposed by flying.

Birds' enormous eyes impinge on the brain's olfactory bulb. Nonetheless, evidence is continually accumulating that avian olfaction is better than commonly assumed. Martin describes how seabirds can use dimethyl sulfide to find productive habitats (see below), how great tits can smell caterpillar damage to leaves, and how some birds use uropygial secretions for species and individual recognition. One of my favorite anecdotes did not make it: the oil industry has used mercaptans to help locate leaks in pipelines by following the turkey vultures who were attracted to these breakdown products of corpses. I also would have liked more information about the distribution and range of odours detected by birds versus other taxa, and about their relative sensitivities to those odors.

In Chapter 4, I learned about "billtip organs", which is where avian touch sensitivities reach their acme; these organs are associated with the lightning speed with which spoonbills, flycatchers, and other taxa snap their bills closed when prey items are encountered. Parrots apparently cannot even see their bills; to successfully forage, they must turn their heads and remember their food's position. I assumed that the sense of taste would not be as well developed in birds as in mammals. However, Martin uses a bolus to taste bud ratio to suggest that chickens have comparable taste sensitivities to mammals. Perhaps this is to be expected; birds must be able to recognize in the food they handle the same nutritional building blocks and toxins as all creatures must. Nonetheless, Martin points out that taste is poorly understood in birds. Last in this chapter is a consideration of magnetite as a potential means of navigation; this topic has undergone several revisions in recent years, and there are still few taxa in which it has been studied. Lots more to sort out here.

Chapter 5 provides a quick segué from senses to sensory ecology. Chapter 6 is about nocturnality. Nocturnal birds can either increase light-gathering capacity (bigger eyes), or increase sensitivity of the existing eye, the latter of which trades off against resolution. The former adaptations have occurred, but not to the degree one might expect. In fact, Leach's storm-petrel, a species that returns to its breeding colony at night to avoid diurnal predators, has eyes that aren't very different from those of humans. And several taxa likely find prey without using vision at all; vibrations may be important in substrates (e.g., shorebirds, ducks), but nighthawks appear to rely largely on chance encounters with insects in the air. Small-eyed kiwi likely rely more on smell than vision and owls can almost exclusively rely on sound.

In Chapter 7, Martin considers the underwater niche where birds forage with limited information. It's tricky to have an eye that works well in both air and water, and it's tricky for a retina to adapt to rapid light changes as one moves vertically in the water column. Consider also the 10,000-fold change in light levels experienced by a parent bird that visits the inside of a nest cavity. In this niche, tactile senses increase in importance. For example, Martin suggests that cormorants don't know what kind of fish they've caught until they bring it to the surface. Similar to nighthawks, the remarkable foraging of these and other diving birds is difficult to explain given the constraints they face; mysteries awaiting solution.

In Chapter 8, Martin develops arguments against why commonly held beliefs about avian vision are not supported by available evidence. I enjoyed this the part of the book the most; I hope my description captures the gist of what Martin argues. A bird's head is roughly spherical. Where would you situate the eyes to best handle the tasks needed to survive? If you move them forward for binocular vision, you lose rear vision, which can be important for detecting predators. If you move them to completely opposite sides of the head, you limit binocular vision and depth perception. In the vertical plane, eyes too high up would be blinded by sun; lower eyes are associated with foraging directly beneath the head such as in herons. Larger eyes may circumvent field of view constraints, but entail extra energetic expense, may mean that more brain space is lost, and may increase mass for a flying organism. Two other ways around field of view constraints are to turn heads, and have eyes that can move in their sockets (up to 20° in birds). Humans have long marvelled at the aerial dexterity of birds that manoeuver through occasionally erratic air currents and tangled vegetation, while they make precise landings and snatch evasive and active prey. Surely, this degree of coordination requires binocular vision, and surely this has been the main driver of the evolution of avian vision. Martin carefully explains that human binocular vision is much better developed. In fact, despite flying forward, no bird's eyes face that direction, not even owls (!). It appears that birds' eyes compete for coordinating bills and detecting predators; vision for flying is surprisingly unimportant. Even in raptors such as falcons, binocular vision is not well developed; Martin suggests that these birds turn their heads repeatedly to pinpoint the location of prey they stalk, and that binocular vision in birds is to coordinate bills (only just before interception of food) and not for depth perception. Surprisingly, maximal binocular vision occurs in corvids, and is maximal in New Caledonia crows (61°). At the other extreme, 360° vision occurs only in species that forage tactilely (many ducks and shorebirds); in other words, where foraging doesn't require eyes, predation has the dominant influence on eye positioning.

Chapter 9 tackles some conservation issues. First is the curious inability of birds, such as storks, to avoid collisions with wires. Martin argues that this provides more compelling evidence that birds invest very little in looking forward. Aside from explaining the mechanics, Martin also contemplates ways to mitigate these collisions. Our human biases suggested that we should add bright structures to wires, but 30 years of this approach have failed to reduce the problem. Millions of years of evolution of using open habitats without worry of collisions hasn't helped. Martin suggests that warning stimuli need to be large, moving, high contrast, and probably include sound. He proposes a few other solutions that deserve some experimental evaluation. The second problem is bycatch of birds in nets; this has contributed to global collapses of many seabird populations. An immediate thought may be to illuminate nets. Even if this were economically feasible, it would also make nets visible to fish, and potentially cause problems for birds adapted to foraging in low to no light. I'm not convinced that Martin's idea of warning panels some distance from nets would work, but neither do I have alternatives that I deem practicable. The third problem is window strikes; this is an arena that also lacks a clear (ha!) resolution.

I found many personal connections in this book: Apparently, the beginnings of avian sensory ecology can be traced to Canadian doctor Casey Albert Wood. I was in the midst of my PhD at the Queens Biological Station when Montgomerie and Weatherhead were confirming that American robins did indeed cock their heads to listen to earthworm sounds to find them. The ability of seabirds to detect the odors of breakdown compounds of green algae, dimethyl sulfide, as cues to rich foraging areas was championed by Nevitt, who does research at the field site of which I used to be director, Bon Portage Island. Nevitt also collaborated on Bon Portage with Kelber and Mitkus to characterize visual abilities of Leach's storm-petrels.

Martin has done a very good job of citing the work of many of his peers. I learned a lot from this book, but also had many questions. How energetically costly are each of the senses? Oilbirds use unsophisticated echolocation in caves to reach nest sites and fly slowly so that collisions are less traumatic, but what about flight of echolocating swifts? Forest owls store much spatial info and have small home ranges presumably to reduce collisions; have their hippocampi been compared to open habitat owls? Why do passerines have maximal binocularity? During our formative years, we were also told that good science leads to more questions.

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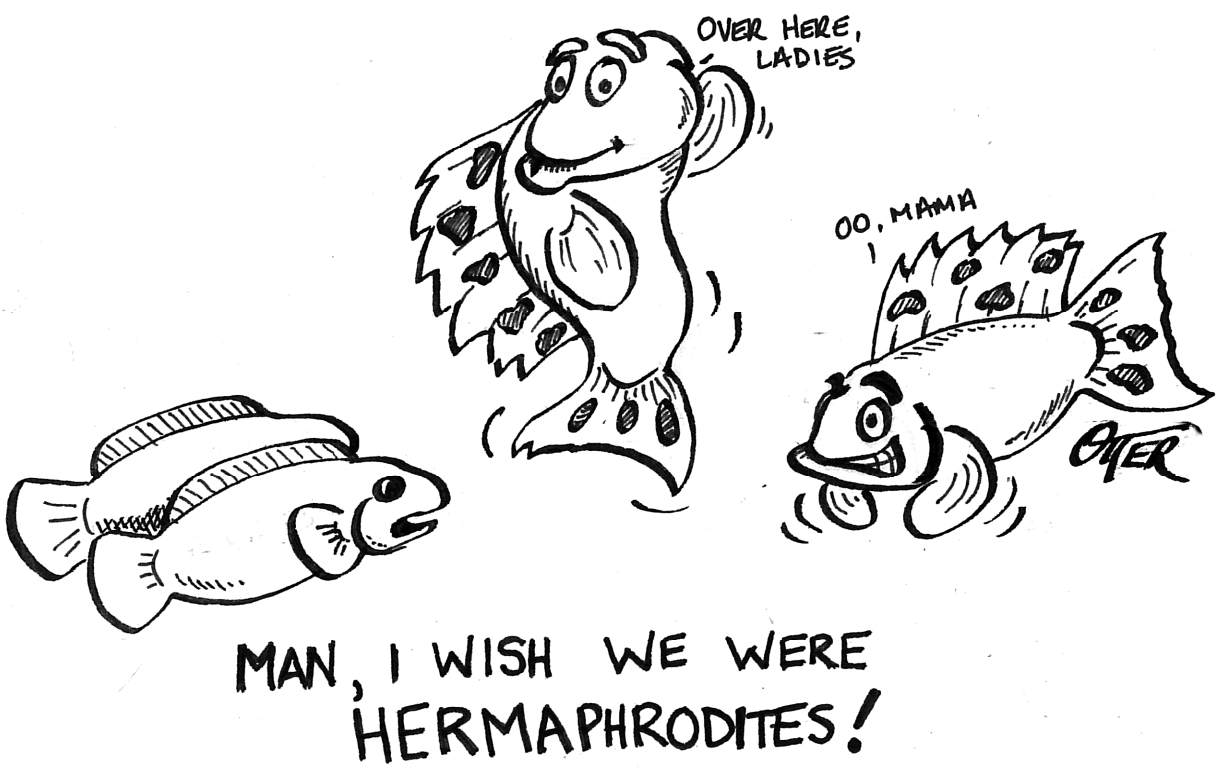

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