



ISBE Newsletter

Supplement to *Behavioral Ecology*
www.behavecol.com

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**Registration for ISBE 2022
in Stockholm is open!**

www.isbe2022.com/registration

WANTED:

Reviewers of the Stockholm Congress

If you are attending the congress and willing to contribute toward a review, email the newsletter editor!
 Young scientists are encouraged to apply.

For inspiration, see earlier reviews in the newsletter Archive, e.g. Vol 26:2, 28:2 & 30:2 www.behavecol.com/newsletter

FROM THE NEWSLETTER EDITOR

The countdown to the next ISBE congress has started and it is of course reflected in this issue, which has a lot of information about the Stockholm meeting. The pandemic has changed how we work and meet, and some of these changes may be permanent. We have an opinion piece about how scientific interactions should be organized in the future.

We also have three book reviews and I would like to extend a special thanks to the book reviewers! Please

also read the obituary for our colleague Marc Théry who passed away early this year.

On page 8, I make a call for anyone interested in creating a network for teachers in behavioural ecology. If you think this is a good idea, please contact me.

Finally, I would like to extend my deepest thanks to all that have contributed to this Newsletter!

P. Andreas Svensson
 ISBE Newsletter editor
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FROM THE ISBE PRESIDENT

The Society's biennial congress the most important event in our calendar. It's a revitalising moment for our field of research, for sharing our latest findings, for connecting with colleagues in person and for welcoming the newest researchers into our Society. Since preparations for ISBE2022 are now gathering pace, I thought it would be a good time to share with you the different ways in which Society funds are being used to make this conference as successful as possible. It is almost four years since ISBE held an in-person meeting, and the Executive Council recognises that this gap has been especially difficult for PhD students and Early Career Researchers. Our goal is to enable as many young researchers as we can to travel to Stockholm, so that delegates at ISBE2022 are as internationally diverse as possible. John Fitzpatrick and his Local Organising Committee have worked tirelessly to meet this goal by putting on an amazing conference, whilst keeping the costs as low as possible. In these uncertain and unpredictable times, this is no mean feat and ISBE owes John and his team a huge debt of gratitude for their huge amount of work. To further encourage attendance, ISBE is offering generous travel grants to around 150 PhD students and post-docs. The Society has also injected substantial funds to keep the registration fee for this meeting as low as possible.

ISBE Congress gives us the chance to breathe new life the work we do as a Society, too, with the Executive Committee and Editorial Boards meeting

to plan their work for the next two years. With the results of the recent ISBE elections now in, I can announce that the following people have been voted by the Society onto the Executive Council, and they will take up their posts at ISBE2022: Professor Mariella Herberstein (Macquarie University, Australia) is the new President-Elect; Professor Mark Hauber (University of Illinois, Urbana-Champaign, USA) is the new Treasurer; Dr Susie Cunningham (University of Cape Town, South Africa) and Dr Kavita Isvaran (Indian Institute of Science, Bangalore, India) are new Councillors. It's great for ISBE to have such dedicated and energetic people in the leadership team and I'm looking forward to working with them all. One other outcome of the elections was that the changes to the ISBE constitution were approved by an overwhelming majority, and they have now come into effect.

ISBE2022 looks set to be a wonderful occasion, and all the more special for the long delay we have experienced since we last gathered as a field. I'm very much looking forward to it – see you in Stockholm!

All good wishes

Rebecca Kilner
ISBE President



ISBE works hard to enable as many young researchers as possible to attend our Congress. Coffee break at ISBE 2018 in Minneapolis.

ISBE EXECUTIVE

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CONTRIBUTIONS TO THE NEWSLETTER

Your contribution is important!

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 and Obituaries for recently deceased colleagues. 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* (around 1500 words) and *Longer reports* (around 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.

Upcoming conferences and events: Please submit information about events that are relevant to the Society. Do this by emailing the Newsletter editor so that it can be included in the "Conference calendar"

The deadline for contributions to the next issue is Sep 30, 2022

CONFERENCE CALENDAR

ASAB Easter Meeting 2022

6-8 April 2022 Newcastle University, UK
www.ncl.ac.uk/cbe/seminars/item/asabeaster2022.html

The European Human Behaviour and Evolution conferences, EHBEA 2022

April 19-22, 2022 in Leipzig, Germany
<https://www.cambridge.org/core/membership/ehbea/>

Society for the Study of Evolution meeting

June 21-22, 2022 Virtual
June 24-28, 2022 in Cleveland, OH, USA
(ASN/SSB/SSE) www.evolutionsociety.org/

ASAB Ethics of Animal Behaviour and Welfare Research for the 21st Century and Beyond

June 21-22 2022
<https://asavirtual2020.wixsite.com/ethics>

Human Behavior & Evolution Society Conference

June 22-25, 2022, Online
<http://www.hbes.com/conference/>

American Ornithological Society (AOS)

June 27-July 2, 2022 in San Juan, Puerto Rico
americanornithology.org/meetings/annual-meeting/

International Union for the Study of Social Insects Symposium

July 3-7. San Diego, USA
<http://burkclients.com/IUSSI/meetings/2022/site/>

International Society for Human Ethology

July 4-8 2022. Liverpool, UK
<http://ishe.org/>

International Congress of Entomology

July 17-22, 2022. Helsinki, Finland
<https://ice2020helsinki.fi/>

ABS 2022 Animal Behavior Society Conference

July 20-23 2022, San Jose, Costa Rica or online
<https://www.animalbehaviorsociety.org/2022/>

ECBB & ASAB Summer Meeting 2022

July 20-23, 2022 in Groningen (Netherlands)
European Congress for Behavioural Biology (ECBB)
<https://ecbb22.wordpress.com/>

AGA Presidential Symposium: Selfish Evolution

July 24-27, 2022 Islandwood, WA
<https://www.theaga.org/>

International Congress for Neuroethology

July 24-29, 2022, in Lisbon, Portugal
<http://neuroethology2020.com/>

ISHE Congress - Intl. Society for Human Ethology

July 25 - 29, 2022 in Würzburg, Germany
<https://ishe.org/ishe-2022-wuerzburg/>

ISBE 2022

July 28 July - Aug 2, 2022. International Society for Behavioural Ecology conference in Stockholm, Sweden, isbe2022.com More information on pages 5-6

International Society for Applied Ethology

Aug 2022, in the Republic of North Macedonia
www.applied-ethology.org/Events.html

ESEB European Society for Evolutionary Biology

Aug 14-19, in Prague, Czech Republic
<https://www.eseb2021.cz/>

International Ornithologists' Union (IOU)

Aug 15-19, 2022. Durban, South Africa, a hybrid conference encouraging virtual attendance
<https://iocongress2022.com/>

ISAE 2022 Congress

The International Society of Applied Ethology
Sept 4 - 8, 2022 in Ohrid, North Macedonia.
www.applied-ethology.org/Events.html

International Conference on Biological Invasions

Sep 13-16 2022, in Tartu, Estonia
<https://www.neobiota.eu/conferences/>

9th International Conference of Poeciliid Biologists

Oct 3-5 2022, Wageningen University, the Netherlands.
www.wur.nl/en/activity/9th-International-Conference-of-Poeciliid-Biologists.htm

National Wildlife Rehabilitators Association Symposium

March 1-5 2022, Madison, USA
www.nrawildlife.org/mpage/Symposium_Home

ESEB, ASN, SSE & SSB joint conference.

July 26 - 30 July, 2024, in Montreal, CA.
<https://eseb.org/congresses/>

WCH10 10th World Congress of Herpetology

August 2024, in Kuching, Malaysia
www.worldcongressofherpetology.org/



International Society for Behavioral Ecology Congress 2022

28th July – 2nd August, 2022
Stockholm, Sweden

Registration for the 18th International Society for Behavioural Ecology Congress is now open! You can find out more by visiting:
www.isbe2022.com/registration/

After a flurry of activity, the deadline to submit abstracts for in-person presentations at ISBE 2022 has now passed. There was a tremendous response, with abstracts submitted from 49 countries spanning the globe. The Stockholm Organizing Committee is busily reviewing these abstracts. We are excited about the amazing science that was submitted and look forward to hearing more about it at ISBE 2022!

Summer in Sweden

ISBE 2022 has been timed to coincide with the Sweden's amazing summers. With daylengths reaching nearly 17 hours at the end of July, delegates will be able to make up for lost time. You'll have plenty of opportunities to catch up old friends and colleagues and meet new friends and colleagues long into the night.

Stockholm is Sweden's capital city and widely regarded as a vibrant, multicultural metropolitan area. Founded more than 800 years ago, Stockholm is a mix of historic buildings and a modern aesthetic. Stockholm is home to three UNESCO World Heritage Sites (one of which you can visit during the mid-conference excursions – see below), and offers access hundreds of museums and world class dining and night life. After your visit to Stockholm, we guarantee that IKEA, H&M, and ABBA won't be the first things that comes to your mind when you think of Sweden!

While offering all the perks of a big city, Stockholm is surrounded by natural beauty. Built on 14 islands, Stockholm offers spectacular views of the Baltic Sea from nearly everywhere. The many nature reserves and green spaces surrounding Stockholm gives visitors easy access to forests to stroll through and lakes to cool off in. The beautiful Stockholm archipelago, a collection of nearly 30,000 islands and islets, is easily accessible from the city centre (and we've arranged

access to the archipelago for those who are interested during the mid-conference excursions – see below).

If you are keen to start planning our Stockholm trip already, you can find further information and ideas about what to do and see in the Stockholm Summer Guide: www.visitstockholm.com/see-do/attractions/stockholm-top-10/

The congress venue

ISBE 2022 will be held at the Stockholm Waterfront Congress Centre, a state-of-the-art facility located in the heart of central Stockholm, only a few minutes' walk from the Stockholm Central Station. The Waterfront offers amazing views of the famous Stockholm City Hall, the location of the annual Nobel Prize banquet, and panoramic views of the city. After the conference wraps up for the day, delegates will be in striking distance of the many museums (many of which have free entry), bars, restaurants, and cultural sites that are found in the city center. In particular, historic Old Town (or Gamla Stan), the earliest part of Stockholm that dates back to the 13th century, is a short walk from the Waterfront. There are also plenty of accommodations options located within walking distance of the Waterfront, ranging from hostels to 5-star hotels.

Scientific Program

We have an outstanding scientific program planned and have secured an amazing line up of plenary speakers from around the world, including:

- Professor Redouan Bshary - University of Neuchâtel, Switzerland
- Professor Mariella Herberstein - Macquarie University, Australia
- Dr Toshitaka Suzuki - Kyoto University, Japan
- Dr Jenny Tung - Duke University, USA
- Professor Yossi Yovel - Tel Aviv University, Israel

ISBE's highest honour, the Hamilton Lecture, will be delivered by Professor Hanna Kokko, University of Zurich, Switzerland.

To find out more about this amazing line up of speakers please see: www.isbe2022.com/program/

Your experience at ISBE 2022

We are committed to delivering an inclusive and engaging experience for our delegates.

We will have an onsite childcare service available free of charge for delegates with families or carer responsibilities. For more information see: <https://www.isbe2022.com/onsite-creche/>

The International Society for Behavioral Ecology supports attendance by students, early career researchers and delegates from developing nations through the Travel Award program. The deadline to apply for travel grants recently passed and we are delighted that so many people took advantage of this opportunity.

We have also lined up some amazing mid-conference excursions and activities for delegates to consider participating in. These include a visit to Drottningholm Palace, the private residence of the Swedish Royal Family that was originally built in the 16th century and a UNESCO World Heritage site, and a guided boat tour of the Stockholm archipelago. More details are available at: <https://www.isbe2022.com/excursions-and-activities/>

While we hope to see you in Stockholm this summer, we realize that not everyone can make it in person.

Therefore, we will be re-opening the abstract submissions for virtual participation in ISBE 2022 soon.

As the conference draws nearer, we will also provide more information about diversity, mentorship and networking opportunities that will accompany ISBE 2022.

Keep your eye on www.isbe2022.com for the latest information. And if you haven't already, be sure to join the ISBE 2022 mailing list to stay up to date on the latest information by going to www.delegia.com/isbe2022 or follow us on Twitter @ISBE2022.

We are looking forward to seeing you in person!

The Stockholm Organizing Committee is delighted to share with you that Sweden has now lifted all COVID related restrictions. While we will continue to monitor the situation, we are committed to making ISBE 2022 a safe and scientifically stimulating in-person event. After a challenging few years, we look forward to hosting you for the 18th ISBE Congress. Welcome to Stockholm!

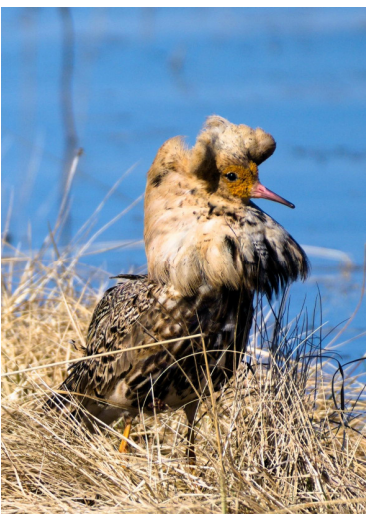
Key dates

Registration opens:	Feb 23
Authors notified about abstract evaluations:	April 15
Early bird registration deadline:	April 29

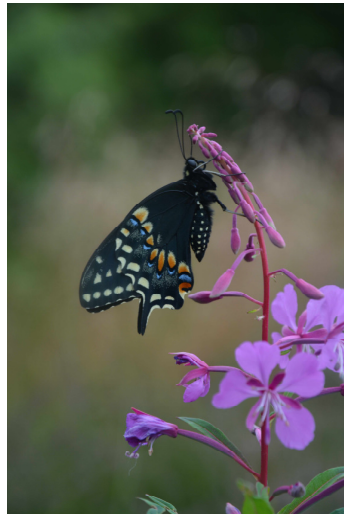
We look forward to seeing you in Stockholm this summer!

The ISBE 2022 Stockholm Organizing Committee
ISBE2022

Some Swedish study species



Photos by: Maxence Gerard



Christer Wiklund



Mats Ittonen



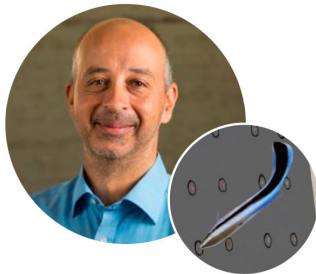
Karin Norén



International Society for Behavioral Ecology Congress 2022

28th July – 2nd August, 2022
Stockholm, Sweden

PLENARY SPEAKERS



Redouan Bshary
University of Neuchâtel, Switzerland



Jenny Tung
Duke University, USA



Mariella Herberstein
Macquarie University, Australia



Yossi Yovel
Tel Aviv University, Israel



Toshitaka Suzuki
Kyoto University, Japan

HAMILTON LECTURE



Hanna Kokko
University of Zurich, Switzerland

Registration is now open!

Find our more at:

www.isbe2022.com

**Keep up to date on all the
latest information**

 **@ISBE2022**

KEY DATES

REGISTRATION OPENS..... February 23, 2022

NOTIFICATION TO AUTHORS (from abstract evaluations)..... April 15, 2022

EARLY BIRD REGISTRATION DEADLINE..... April 29, 2022

Photo Credit: R. Bshary, S. Rowell, B. Archie, K. Seppälä, M. Herberstein, Y. Barkai, T. Suzuki

PRE CONGRESS SYMPOSIUM

How can we achieve a productive collaboration between game-theory modellers and empiricists?

Pre-congress symposium for ISBE 2022, Stockholm:

The aim is to bring together empiricists that study phenomena or issues that involve frequency dependence and game-theoretic modellers that are interested in how their theory can help to understand real-world phenomena.

This symposium will be held at Stockholm University, Department of Zoology - start at 10:00 on Thursday 28 July 2022, end at 16:00 the same day.

If you wish to attend, please contact one of the organisers:

Olof Leimar (olof.leimar@zoologi.su.se)
John McNamara (john.mcnamara@bristol.ac.uk)

A BEHAVIOR TEACHERS' NETWORK ?

Teaching behavioural ecology is awesome! Students love animal behaviour and, naturally, so do we. Many of the ISBE members are active teachers and between us we have tons of knowledge and experience from teaching behaviour courses.

However, many of us lack colleagues at our own department which which to discuss. Recently employed lecturers may have many questions on how to organize a behavioural ecology course. Who do you ask?

Would it not be great with a forum where teachers could share their knowledge and learn from each other? It could be practical tips like a new text book that is coming out, or perhaps great online resources. Perhaps you have suggestions for well functioning field projects or experiments that do not require welfare permits.

I have long wished for some form of network for ISBE's teachers, but don't know how it would best be organized. A web page, a mailing list, an online forum, post-conference symposia?

The point is we have to start somewhere. If you think a teachers' network is a good idea, please email me.

If there is enough interest I will organize an informal pub night at ISBE 2022 in Stockholm where we can discuss how to proceed.

Andreas Svensson
andreas.svensson@lnu.se



Designing good student research projects can be challenging. Here are some students hard at work testing the Ideal Free Distribution in wild sticklebacks.

Can ISBE contribute to making behavioral ecology more sustainable?

For decades scientists have been warning about climate change and the accelerated loss of biodiversity (e.g. IPBES, 2019; IPCC, 2021). It is scientific consensus that humanity needs to change and adopt a more sustainable style of living to maintain or restore planetary boundaries and avoid tipping points beyond which the warming of the earth and the loss of biodiversity can no longer be controlled (Steffen et al., 2015). So far, scientists mainly analyzed the situation and suggested potential solutions and remedies. However, science also needs to become a role model to demonstrate that a more sustainable future is possible. I wonder how ISBE can contribute to this?

Many countries have declared to reduce carbon emissions and become carbon neutral within the next two decades. Science should take a lead in this transformation, and especially as behavioral ecologists we should be motivated to do so, as we watch many of our study species waning and their ecosystems being more and more degraded. For these reasons, our incentive to reduce our own impact on climate and biodiversity should be particularly high. Reducing our carbon emissions would be a first step lower the weight of the ecological footprint of science (Lettenmeier et al., 2009). Flights to research and conference destinations contribute a large share to the CO₂ budget of science, as shown by the calculations of Jahnke et al. (2020) and Ciers et al. (2019) for individual research institutions and of Bousema et al. (2020) and Burtscher et al. (2020) for international science meetings. Therefore, scientific societies such as ISBE have a big lever towards developing a more sustainable science. The Covid-19 pandemic has shown that many scientific formats can be moved online or hybrid. This does not only contribute to reduce the ecological footprint of science, it also removes barriers: scientists from low-income countries or with small children can more easily participate in scientific debates. At the same time, in-person meetings will – for the foreseeable future – remain important for scientific and social exchange and cannot entirely be replaced by digital formats.

However, in the field of animal behavior research there are two major international scientific conferences, the International Ethological Conference (IEC) and the conference of the International Society for Behavioral Ecology (ISBE), both of which are held every two years and alternate. In the last decades, research in animal behavior has become quite integrative and interdisciplinary, so that the topics of these two big international conferences are nowadays quite similar. Hence, we have a major international behavioral biology conference, to which each of us could potentially go, every year. If instead both organizations would hold their respective conference

only every four years (and offer a hybrid format), behavioral biologists could still attend a major international conference every two years, but conference-related greenhouse gas emissions from air travel by behavioral biologists could possibly be halved. This could be a first step to larger sustainability in behavioral ecology to which ISBE could make a large contribution. I wish ISBE representatives would consider such a change in the frequency of the ISBE meetings (maybe have smaller, biannual digital meetings in between) and approach the organizers of the IEC to come up with a similar change in the schedule of their congress. This could be a first but significant step of behavioral ecologists to reduce our carbon impact on the planet.

Wolfgang Goymann

Max Planck Institute for Ornithology, Germany

References

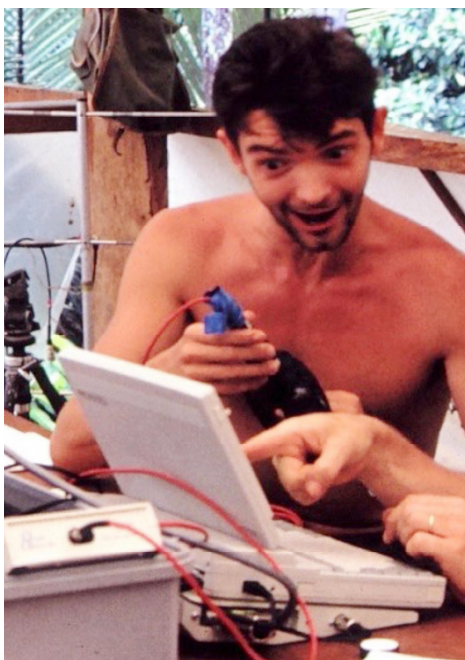
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MARC THÉRY OBITUARY

Dr. Marc Théry, Research Director at CNRS-MNH, Paris, and a frontal figure of French behavioral ecology, sadly passed away at age 60 on January 2nd, 2022, after a bout of illness. He will be sorely missed by family, friends, and colleagues.

The tropical forests were Marc's second home, in particular the French Guiana field station "Les Nourages", where he studied manakins, cock-of-the-rock, and other species with respect to mating systems and sexual selection, as well as dispersal and conservation issues. With his doctoral companion Pierre-Michel Forget, and many others, Marc spent countless hours in the field, emptying mist-nets or waiting for action at a manakin lek. It was here that he first perceived the importance of ambient light and color as the stage in which these mating systems evolved. Marc was a happy and gentle man, sharing his insights about how to measure light and colors and what these plots really meant with everyone. One could literally feel his joy when students and collaborators would "get it".

After his doctoral studies (late 1980's) of the lek mating systems and displays of manakin species, Marc was one of the, at the time, relatively few French participants at the 3rd ISBE conference in Uppsala 1990. Here a postdoc and lasting friendship with Jack Bradbury and Sandra Vehrencamp were forged, as well as a subsequent collaboration with John Endler that resulted in their pioneering and widely cited spectroradiometric study of plumage color signals and light ecology (Endler & Théry 1996). A year later, one of us (SA) joined Marc at Les Nourages and explored manakin and other dazzling plumages with the first-generation miniature UV/VIS spectrometer (OceanOpticsS1000) – it was love at first reflectance!



Marc measuring plumage reflectance at Les Nourages, French Guyana 1993. Photo: Staffan Andersson

Marc became passionate about the behavioral ecology of color communication in animals, notably birds and arthropods, research areas in which he had a major international impact, not least through his long engagement in ISBE. Marc's expertise in reflectance spectrometry and analyses was unique in France. His care for details, his precise instructions about how to master spectrophotometers suddenly available in most labs working on behavioral ecology – up to the frequency with which one ought to (re-)calibrate with the "white" or how to position the fiber on a delicate and round beetle thorax- was unique in France and made him a highly sought expert all over the country. When one of us (JC) suggested to join forces to tackle the century-old question of crab spider color mimicry, Marc enthusiastically took on the technical challenges. A decade-long collaboration then started, with the most-cited work (2002) being carried out in the home garden in Tours - fieldwork is fieldwork!

Over time, Marc's community services increased sharply and expanded until his death. One of his major undertakings was when he and one of us (JC) co-organized the ISBE meeting in Tours in 2006, which at the time was the largest ever held, a fitting culmination of Marc's devotion to ISBE and the promotion of French behavioral ecology. He was also the European secretary of the association for the study of animal behavior (2004-2010), and one of the editorial members of Behavioral Ecology (2014-2017). At the national level, he was one of the directors of the "GDR Ecologie Comportementale", a CNRS conglomerate of all labs working on the topic, and team leader of the CNRS/MNHN research unit MECADEV since 2014. He also solicited funding and organized several international symposia devoted to signal evolution and related topics.

In recent decades, Marc and collaborators (M. Perret, F. Aujard, T. Lengagne, J. Secondi, and others) studied color vision at night in mammals and amphibians and, most recently, the role effect light pollution on animal life. While this is apparently another application field of his knowledge, Marc's deep motivations had not changed: precision in measurements, field work under any conditions, deeply thought interpretation according to physiology and ecology and a keen eye on conservation opportunities. With collaborators and students, Doris Gomez in particular, Marc undertook a community-wide study of how different patterns of light at different levels in the tropical forest lead to different patterns of color signaling in the resident animals. That work has moved the focus from descriptive studies of individual species to finding general principles for entire communities. This broad approach will surely continue without him, but his breath of knowledge and insights will be greatly missed.

→



Riding horses was one of the many other passions of Marc Théry. Photo by Laurence Théry.

While Marc was fluent with recent advances in the theory and mechanisms of signal evolution, his own insights and contributions largely came from his great familiarity with the environments in which signals evolve. As noted earlier, his greatest love was the tropical forest, and he had become quite concerned in recent years with threats to that forest. He thus would be pleased to know that a fund to protect the cock-of-the-rock and its forest in French Guyana has been established in his honor (**Fond Marc Théry en faveur du Coq de Roche**). Information about this fund and contributions can be made at:

<https://www.helloasso.com/associations/gepog/formulaires/2/en>

Jérôme Casas (Tours, casas@univ-tours.fr)
Staffan Andersson (Göteborg),

with the help of Jack Bradbury and Sandra Vehrencamp (Cornell), Pierre-Michel Forget and Fabienne Aujard (Paris).

PHD OPPORTUNITY

Does neural activity drive seasonal plasticity in the brains of food-hoarding birds?

A fully funded 3-year PhD studentship to study how neural activity relates to seasonal plasticity in the hippocampus of food-hoarding birds.

Processing large amounts of information can majorly impact brain morphology. It is difficult to model such impact in laboratory animals, but some wild animals, like hoarding birds, naturally process large amounts of information.

Hoarding intensity in food-hoarding tits and chickadees peaks in the autumn. These birds use spatial memory not only to retrieve hidden food, but also to optimally distribute new caches. The hippocampus is a brain structure that is involved in this spatial memory. It increases in volume in autumn, when hoarding intensity is high, and decreases again in winter when hoarding continues, but at lower intensities. We hypothesize that this increase in volume in autumn is not directly caused by changes in hoarding motivation, which stays high throughout winter, but instead that it is caused by the increased hippocampal activity involved in the memorization of thousands of locations. We also think that newly generated neurons play a special role in encoding these memories and therefore in the seasonal changes in the hippocampus.

Supervised by Tom Smulders (expert in seasonal hippocampal plasticity) and Tim Boswell (expert in avian appetite regulation), you will:

- 1) Identify the brain areas involved in hoarding motivation using the immediate early gene c-Fos
- 2) Investigate the seasonal pattern of activation of the identified brain areas using a marker of long-term neuronal activity, Δ FosB.
- 3) Test the prediction that activation of the hippocampus, but not of the hoarding motivation brain areas, predicts the seasonal pattern of hippocampal volume changes.
- 4) Investigate the role of newly generated neurons in hippocampal seasonal plasticity by double-labelling with Δ FosB and Doublecortin, a marker of new neurons.

This project is ideal for anyone interested in the neural basis of natural behaviours and/or in large-scale brain plasticity and its underlying mechanisms.

DEADLINE: April 7 2022

Enquiries email and address:

Dr Tom V Smulders tom.smulders@ncl.ac.uk

For all the details of the project and how to apply see: <https://www.findaphd.com/phds/project/does-neural-activity-drive-seasonal-plasticity-in-the-brains-of-food-hoarding-birds/?p142884>

Crab Comics: a scientifically-informed cartoon series

'Crab Comics' is one of the scientific outreach projects of the Laidre Lab at Dartmouth College. These comics are drawn by Sarah Smith, an artist who runs the Book Arts Workshop at Dartmouth's Library. Sarah has been collaborating with our lab for several years. In 2019, she also joined our research team in Osa Peninsula, Costa Rica to overlap with us in the field and meet the social hermit crabs (*Coenobita compressus*) we study. Following that trip, Sarah worked with us to create the first 'Crab Comics', a scientifically-informed cartoon series. Each cartoon in this series is based on one of our peer-reviewed scientific papers on the social hermit crabs. Compared to scientific papers, which are intended for a specialist audience, these cartoons are intended to be accessible to a broader, more diverse group of people. Indeed, our overriding goal with 'Crab Comics' is to expand the audience who can understand and appreciate scientific discoveries in animal behavior and behavioral ecology, thereby better engaging non-scientists of all ages in science. And yup, we also hope to make some folks laugh... or at least try!

For each cartoon, Mark (the PI and scientist) works together with Sarah (the artist) to help translate the science for a broader audience. In our jargon-free discussions about the detailed results within each paper, both of us (artist and scientist) brainstorm ideas, exchange draft sketches of potential cartoons, and then ultimately converge on a cartoon we think elegantly distills down the core scientific discoveries of the paper. We endeavor for a funny tone, sometimes darkly humorous and occasionally drawing analogies with human architecture, housing markets, and social life. We plan to make such cartoons for each new scientific paper the Laidre Lab publishes on social hermit crabs. And we also plan to make cartoons for every previous paper—spanning back over a decade—that we've already published on social hermit crabs. When sharing each cartoon, we pair it with the reference or link to the original scientific paper, so that any readers who want more than merely a laugh can dig deeper into the actual science. Eventually, we'd like to assemble all these cartoons into a co-authored book, targeted to a lay audience, with all the cartoons being drawn by Sarah and the associated text being written by Mark. Further details about these scientific outreach efforts by the Laidre Lab are provided in the blog below, which Mark wrote for the field station (Osa Conservation) where we do much of our research: <https://osaconservation.org/scientific-outreach-animal-behavior-day-crab-comics-and-planet-earth-iii/>

Perhaps some of the 'Crab Comics' from our artist-scientist collaboration might amuse you. Or maybe they'll even help inspire further scientific outreach efforts by fellow scientists. Regardless, here are two examples. Cartoon # 1 is based on Laidre Lab PhD student Clare Doherty's very first scientific publication (Doherty and Laidre 2020). And Cartoon # 2 is based on postdocs Jakob Krieger and Marie Hörnig's first

paper on social hermit crabs (Krieger, Hörnig, and Laidre 2020). References to these papers are below, and further 'Crab Comics' are currently in the works for more recent papers (e.g., Laidre 2021). We hope these comics may brighten your and others' day.

Mark E. Laidre

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Yeah, you're gonna need one that actually fits through the door.

Cartoons by:

Sarah M. Smith

Book Arts Workshop, Dartmouth College Library,
Hanover, NH 03755, USA

Email: sarah.m.smith@dartmouth.edu

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Evolution What Everyone Needs to Know

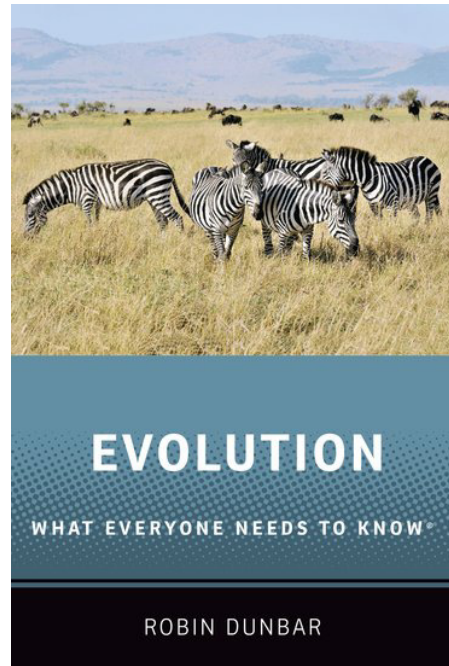
By Robin Dunbar

Oxford University Press. 2020. 160 pp.
ISBN: 0190922885

Charles Darwin's "On the origin of species" was published more than 150 years ago and laid the foundation for our today's understanding of the natural world. Despite its fundamental importance, Darwin's theory has not remained unchanged. Major findings, e.g. the molecular mechanisms of reproduction and inheritance, have been incorporated and refined it to an even more impressive concept. Countless studies and researchers have found support for this theory, yet it is often underestimated how far-reaching the consequences of evolution are and many misconceptions persist until today. Even for people who do not doubt the existence of natural selection and evolution, it can be hard to accept their impact on our own ancestry and biological history. How can natural selection result in such "complex" and seemingly unique things as our modern societies or our culture? Even if selection affected our ancestors, have we not freed ourselves from its pressures and overcome the need to maximize fitness at all costs? If we are simply hardwired to maximize fitness, how can there be things like free will or true altruism?

Within this book, Robin Dunbar attempts to answer such questions – in fact, a total of 100 questions – taking the reader on a guided fast-travel tour through the field of evolutionary biology. This tour is split into ten chapters. Each chapter covers one specific topic, with each topic building upon the previous one. The first chapters focus on basic concepts and mechanisms of natural selection and evolution including genetics and the modern synthesis. After laying these fundamentals, the remaining chapters illustrate the evolution of life, species, complexity, behaviour, sociality and finally culture. Throughout the book, Robin Dunbar attempts to keep a conversation-like structure in which any explanation, every answer is followed by another question that could be a natural follow-up. Importantly, Dunbar manages the balancing act of providing the details necessary to understand the answer, while keeping the answers themselves short and clear. Instead of providing only technical terms and biological explanations, Dunbar illustrates each answer with graphical and interesting examples from a variety of fields.

Overall, the book is an easy and entertaining read. Its structure and the clarity of its arguments and explanations make the book suitable for a broad audience, ranging from experts in evolutionary biology (or certain areas within) to non-scientists. In addition, having separate questions that are answered within a few pages each while building up upon each other makes this book a very pleasant companion for any



kind of situation. Whether you have a few minutes to fill in the public transport or you have the opportunity for an extended reading session during a boring Zoom-meeting, it is easy to step-in and step-out of the reading.

Sticking to Robin Dunbar's approach of asking and answering relevant and interesting questions, as a potential reader you might ask these:

Will the book prove evolution to be true?

No! Neither will this book make you an expert on any of the topics dealt with. Dunbar explains why and how evolution works throughout many questions and you will get a broad and good overview of many ideas and concepts. But this is not the main target of this book. The author himself states that there other books are much better suited for this task. The main aim of this book is to showcase the notion that evolution has major consequences throughout biology, social sciences and, finally, humanities.

Is it then at least covering everything there is to know about evolution?

Again a no! As any book, certain things will be highlighted more than others, while some aspects will not make the cut at all. This is especially true for a book of such comparably short length. With the start (concepts of the theory of evolution) and the end (evolution of human behaviour, sociology and culture) being set, the questions and topics leading from one to the other in a natural way are limited. Still Robin Dunbar managed to fill this book with a plethora of ideas, mechanisms, concepts and mechanisms.

Then, who should read this book? And why?

As for any book, this completely depends on what you are looking for. This book might not be interesting for you if you want extensive and detailed explanations of very specific concepts of evolution and natural selection. It might also not be relevant to you if you want a complete overview of basically everything there

is to know about evolution. And it might not be for you if you are looking for questions still unanswered.

However, this book could be perfect for you if you are looking for a general overview of various evolutionary concepts and mechanisms written in clear and graphical ways. It could also be ideal for you, if you want a book that focuses not only on the evolution of animals and plants but also on that of human behaviour and society. And, in more general terms, this book is perfect for everyone interested in evolution,

looking for a book that is entertaining, easy to follow and informative at the same time. Personally, I can only state that I deeply enjoyed reading this book and that I would recommend it to anyone with the slightest interest in natural selection, evolution and how they affect human behaviour, sociology and culture.

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BOOK REVIEW

Male Choice, Female Competition, and Female Ornaments in Sexual Selection

By Ingo Schlupp

Oxford University Press. 2021. 164 pp.
ISBN: 9780191859892

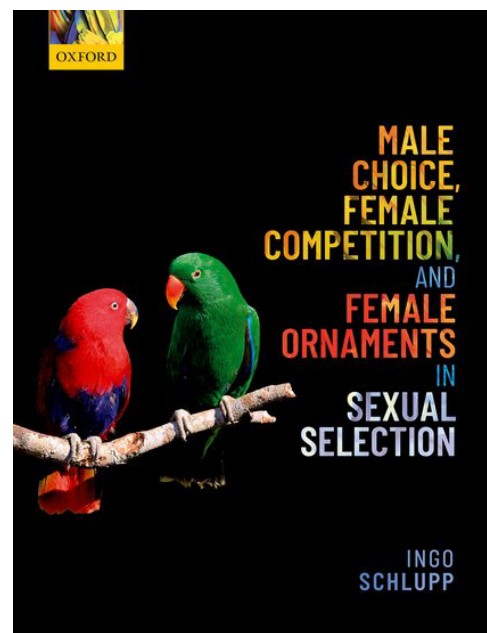
Imagine an animal with a bright sexual ornament. Now imagine an animal that is fighting for a mating opportunity.

What did you come up with?

My guess is that most people's mind wandered to a brightly coloured male (like a peacock or guppy) and two males locked in a contest (like red deer stags or elephant seals). If this is what came to mind it is with good reason. Males are often brightly coloured and use their sexual ornaments to attract females – after all, female mate choice is an incredibly powerful selective force shaping male traits – and males in many species engage in conspicuous competition for access to mating opportunities. This focus however has traditionally meant that choice and competition are viewed through a specific lens, with females choosing and males competing. In this lively and engaging book, Ingo Schlupp eschews this traditional view and instead focuses on what he calls the 'orphans of sexual selection theory': *male* choice and *female* competition.

Choice and competition – just not how you usually think of them

Choice (among potential mates) and competition (for access to mates) are massive, foundational topics in sexual selection. And at first glance it may seem impossible to distill these topics in a concise way. Rather than tackle these topics in their entirety, Schlupp maintains the reader's focus on male mate choice, including its potential links with female ornamentation, and female competition. This focus is accompanied by Schlupp's engaging and digestible writing style that tackles evolutionary topics in a



readable way without shying away from their complexities.

The first two chapters of the book provide a background to sexual selection theory. These chapters describe the prevailing view of female mate choice and male-male competition that has come to dominate the field, provide the conceptual background to male mate choice and female competition, and discuss the similarities and differences between female and male mate choice. Essential concepts in sexual selection (e.g. sex roles, anisogamy, Bateman gradients, operational sex ratios and parental investment) are introduced and set in an ecological framework. In carefully connecting these essential concepts to the topics of choice and competition, Schlupp develops the central thesis of his book – that mate choice is not confined to the sex that invests more in reproduction and that ecological factors can have a dramatic and often overlooked role in shaping both choice and competition.

A substantial portion of the book (chapters 3-6) focuses on male mate choice. Chapter 3 provides an overview of examples of male mate choice across the animal tree of life, clearly demonstrating that male mate choice is not an isolated behaviour and turns up

even when researchers aren't looking for it. From there, the book examines male mate choice from the perspective of what males choose (usually direct benefits, Chapter 4), the relationship between male investment and male mate choice (it is usually positive, Chapter 5), and the mechanisms that influence male mate choice (the operational sex ratio is a big player, Chapter 6). Schlupp argues that males probably face higher costs of reproduction and that females vary in quality more than typically acknowledged. Together these chapters leave little doubt that male mate choice is extremely common, offers fitness benefits and can be shaped by ecological conditions.

Chapter 7 and 8 focus on females, examining female ornaments and female-female competition. While female ornaments are found in a great many species, their function and evolutionary origins remain challenging to pin down. Schlupp points to social selection and male mate choice as main selective agents and argues that non-adaptive explanations for female ornaments (i.e. they are a byproduct of selection for male ornaments) are unlikely to explain their prevalence. Female-female competition is also common and wide-spread, with females competing for males or, more often, for resources linked with reproduction.

The book finishes with a forward-looking synthesis that summarizes the main messages of the book. Here and throughout the book, Schlupp articulates a view of sexual selection that is far more dynamic and complex than the standard binary view of one sex choosing and the other sex competing. Schlupp reminds the reader continuously that choice and competition are not fixed, can be expressed along a continuum, and are responsive to ecological and social conditions. The book ends with calls for the development of additional theory and a broad empirical approach that examines both proximate and ultimate explanations for male mate choice, female ornamentation and female competition.

The book is written by an expert in the field that brings a wealth of knowledge to bear on the topic. This allows Schlupp to take the reader on an expansive journey across the animal tree of life. Yet instead of straying into a purely encyclopedic treatment, Schlupp infuses the text with a first-person narrative that doesn't shy away from clearly stating his opinion and areas where future work is needed. This creates a lively, conversational tone throughout the book. That isn't to say that the book is light on details – it does a great job in summarizing the field. Whether contemplating what studies are needed to get a more complete view of sexual selection, musing on the limitations of dichotomous choice tests, or speculating about potentially interesting experiments that could be done

in Portugal ('Algarve is a wonderful area and field work there is great fun!') you get the sense that the field is bursting with potential.

Does this book succeed in shining a light on the 'orphans of sexual selection theory'? Absolutely. Yet it is hard not to notice the imbalance in the treatment between male mate choice (four chapters) and female ornaments and competition (two chapters). Similarly, despite the broad taxonomic coverage throughout the book, ranging from insects to a surprisingly large number of human examples, the coverage is clearly skewed towards vertebrates. Some specific examples come up in several chapters (e.g. Scandinavian gobies) giving a sense of repetition at times. Yet these imbalances and repetition stem from the limitations of what is currently known about these topics and Schlupp admirably takes the time to detail areas of future work that will advance the field.

Members of the ISBE community will enjoy this book, particularly those with an interest in sexual selection and evolutionary biology. Experienced researchers will enjoy the forward-looking nature of the book and the identification of gaps in the literature in need of empirical and theoretical attention. Students will also find this book an approachable way to get caught up with current sexual selection research. The first two chapters in particular are among the clearest, most cogent descriptions of modern sexual selection theory wrapped up in a few pages that I have come across. This alone will make this book required reading for all students joining my lab in the future.

Researchers in the field of sexual selection may point to key papers that demonstrated male mate choice or female competition decades ago as evidence that the field is well aware of these topics. But the numbers Schlupp presents are hard to dispute. Over the past decade, between 10-25 papers are published each year on either male mate choice or female competition. In comparison, around 200 papers are published per year on female mate choice and roughly 140 papers per year are published that focus on male competition. It is not clear if this difference in publication effort is due to male choice and female competition not being prevalent (as traditional theory would suggest) or because researchers either haven't been focused on them and/or their expression is subtle (as Schlupp argues). If this book has its intended purpose of spurring on greater empirical and theoretical work on male choice and female competition then surely time will tell.

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The Evolution of Social Behaviour

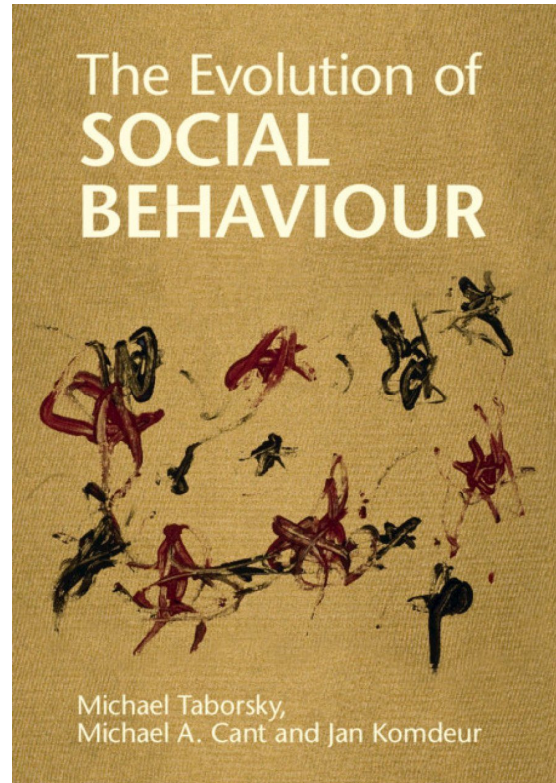
By Michael Taborsky, Michael Cant, and Jan Komdeur

Cambridge University Press, 2021. 410p
 ISBN 978-1-107-01118-2 Hardback
 ISBN 978-1-108-74616-8 Paperback

On a recent afternoon I arrived home wrung out from a bad day. Obstinate administrators had set back the future of the department, a colleague had not completed a key task on time, and a manuscript received an insulting review. As a few kind words from my wife and a purring cat in my lap began to lower my blood pressure, outside our window a party of blue jays was taking turns at our bird feeder. Social behavior! It is the joy and bane of being human. For many a behavioral ecologist, observing it in other organisms and sorting out how it might have evolved drives us to return to the fray and do it again the next day. *The Evolution of Social Behavior* nicely captures the fascinating diversity of social behavior and some of the cool ideas used to explain it in a refreshing new way.

I was initially ambivalent about reviewing *The Evolution of Social Behaviour*. Another book on social behavior—aren't there, like, a thousand on this topic? Even small slices, such as mate choice, communication, various forms of conflict, parental care, and, of course, cooperation are all subjects of books on their own. And gee, Cambridge just published an edited volume (Wilczynski and Brosnan 2021) seemingly on the same thing. Another book on the whole topic seemed likely to be either superficial or redundant. But the three authors are empirical leaders in the study of social behavior and their study subjects (insects, fish, mammals, birds) are diverse. I was further intrigued by how this book was written—the three periodically met in person in scenic places to hammer out sections together. In this day of Dropbox, Google docs, and social distancing, that seemed as if it was a wonderfully fun and compellingly social way of collaborating. I was eager to see the result.

I am glad I agreed to this task, as there are many fresh takes and places where the book's approach to social behavior indeed piques one's passion for the topic. The book is structured around the core idea that the main driver of social behavior is competition for scarce resources (predators emerge as another factor here and there, but the focus here is on what happens after groups form, rather than why they do so in the first place). Organisms have evolved ways to race to, fight over, or share resources, with the details of how resources are distributed and obtained in the context of competitors driving variation in sociality. This nifty way of organizing thinking about social behavior is made even grander early in the book by applying it to several levels at which "social" interactions can occur—between molecules in the emergence of replicating proto-organisms, between cells in the evolution of



eukaryotes and then again when multicellular organisms arose, and between individuals. The authors deliberately focus on this latter level, a decision that disappointed me some but was also completely understandable; I was assuaged a bit as the broader idea resurfaces in several places throughout the book, gaining a bit of richness each time.

A refreshing structure of the chapters is that each one ends with a case-study of a focal animal. Multiple boxes, especially in Chapter 4, provide additional looks at specific systems. While the case studies do not always fit cleanly with the chapter they follow, they are nevertheless fascinating to read. The authors' own study systems of Seychelles warblers (Komdeur), banded mongooses (Cant) and *Neolamprologus pulcher* cichlid fish (Taborsky) are joined by paper wasps (a bevy of contributors including Cant), ambrosia beetles, and humans. In the foreword, Nick Davies, in his typically insightful writing, recommends reading these case studies first but going from back to front; they alone provide a good introduction to the ideas in the text. In total, the vignettes reflect diversity in behavior and taxonomy. They also emphasize the insights that a combination of clear and clever thinking and hard work over many years can produce. They are well-written and all fascinating reads—several times I found one limb had fallen asleep while I was reading them on my couch, and I hadn't noticed until I was finished!

Another compelling feature is that the book embraces the triangle of Concept-Theory-Data that has made behavioral ecology such a successful endeavor. The book is strongly conceptual, explaining in clear language key ideas that apply universally to social behavior. This blend makes the book exceptionally

useful for beginning graduate students as they develop skills in crafting the general purpose of what they are specifically studying. Theory is also well reviewed here without much math. Verbal presentations of mathematical models are often necessary, but in places, most notably midway through Chapter 3, some of the modeler's jargon (e.g., open-box v closed box models of negotiation?) gets overwhelming. As might be expected from a lean book on social behavior, readers should view sections of this book as a useful way to get oriented, with the arduous work of understanding each topic requiring one to go to the original papers. The third corner of the triangle, data, is one of the book's strengths. Beyond the case study vignettes mentioned above, the text often reviews key empirical studies. Readers should recognize that these reviews are not exhaustive, and many topics are given woefully short shrift (more on this below), but the more thoroughly reviewed topics are rich and insightful, often focusing on conflicting or ambiguous results. The result is a sophisticated overview of some challenging topics.

Chapter 1 gets the book started with the core idea of competition and a summary of evolved solutions. It also deals with the thorny problem of definitions. Because the topic of social behavior crosses so many disciplinary boundaries, terminological issues abound. The authors make the decision to wade into this only briefly, preferring broader and potentially more vague definitions to a proliferation of overlapping but sometimes confusing jargon. They discuss the interesting tension between precision and accessibility in defining terms, given that behavioral terms are so often reaped from everyday language, they are accessible but also ripe for misinterpretation. Despite bringing it up, they do not settle the issue (which may not be settleable; different solutions might need to be applied depending on the circumstance). They do touch briefly on an important philosophical problem with many definitions in behavioral ecology: defining a phenomenon to be explained in terms of a given explanation. West et al's (2007) definition of cooperation as a behavior that is selected for because of its effect on the recipient is a focal example. While they criticize this definition for its operational impracticality, they miss an opportunity here to distinguish more generally the consequences of defining what we want to explain in terms of the processes that we propose to explain it. In the case of cooperation, clarity is gained if we separate a category of social interactions in which some form of aid is given (a phenomenon in need of explanation) and the process by which alleles that influence aid-giving might spread through a population (a process explaining the phenomenon). This problem of definitions of phenomena that include elements of a hypothesized explanation applies to many terms in behavioral ecology (e.g., parental care, Clutton-Brock 1981; pace-of-life, Dammhahn et al. 2018; signals, Searcy and Nowicki 2006). Such terms are not easy to define operationally, but an explicit discussion here would have been useful. While I appreciated their decision to use more general definitions, that does produce a few issues in specific places, noted below.

Chapter 2 focuses on the race (i.e., scramble or exploitation competition) for resources. The treatment

of pure exploitative competition is brief. The ideal-free distribution is introduced, but the wealth of research on that idea is not dealt with in any depth. The chapter quickly moves to more social forms of competition, such as economic defense and optimal aggression. The producer-scrouter game is introduced, but again the rich empirical literature on this idea is not covered thoroughly. Using this early example to introduce game theoretic thinking to readers new to behavioral ecology is an opportunity missed. Chapter 2 should be viewed as the salad bar of the book—lots of toppings displayed but not much exploration of the culinary diversity in their use. I sympathize with the authors as it would be too much to treat each of these in the same depth as topics covered in later chapters, but some explicit guidance to sources that do so would have been useful. Readers with expertise in these areas of social behavior should come to the book expecting to learn fascinating new things about other topics, but not necessarily about their own. Graduate students should recognize that the book is not an unbiased representation of all the interesting work in social behavior but highlights important and fascinating work in some at the expense of others. Nevertheless, the overall organization of these topics provides a fresh conceptual framework.

Chapters 3 & 4 comprise the core of the book. Here the authors switch from an overview of topics to a more focused exploration of the array of approaches used to develop theory and the empirical data of relevance. In Chapter 3, the problem of conflict in social groups is tackled. This chapter is perfectly suited for several sessions of a graduate seminar, as there are both big ideas and many specifics that will stimulate discussion. Here the tension between cooperation and conflict that exists at multiple hierarchical levels (genes and genomes, cells and multi-cellular organisms, individuals and groups) is fleshed out some by noting that transitions to more cooperation are often accompanied by circumstances that limit conflict. The evolution of a meiosis in which Mendel's 2nd law of independent assortment arises is an intriguing potential example of a mechanism limiting inter-gene conflict. It's so intriguing I wanted more, but the flow here forced me to file it away for another day. An important issue needing more scrutiny is whether the evolutionary steps that reduced conflict were adaptations for that or byproducts of other selective forces. The authors sidestep that issue, focusing on factors affecting the level of conflict between actors and then how suppression of conflict can lead to the emergence of cooperation.

Conflict is a major force in social behavior and manifests in a variety of ways. Given that there is a whole book devoted to just sexual conflict (Arnqvist and Rowe 2005), it will be obvious that Chapter 3 is a selective set of topics. Many cool ones are given only brief mention. There is a woefully superficial discussion of reproductive conflict, mating skew, and extra-pair copulations. Dominance hierarchies are also not fully explored, with the huge literature on avian hierarchies totally ignored. Parental care conflicts are also given short shrift as partner conflicts, parent-offspring conflict, and sibling rivalry are covered in a few paragraphs. Partner conflicts over parental care emerge a couple of times elsewhere in the book but

are never tackled in much detail except as a specific example in which theory on negotiation may be applied. A particularly strong section is a lengthy review of models of social conflict. This is not a broad overview; the authors are explicit in stating that they focus on three traditions: population structured kin selection, sealed bids, and behavioral resolution models. I gained new understanding about each of these approaches, and I will be using this section repeatedly as an insert into this literature, but there are some costs to doing things this way. First, connections to many other approaches to conflict are missing, and so students especially will be initially unaware of different traditions. I also felt the writing shifted here from a more introductory tone to heavily technical quite abruptly, so some readers may find some parts tough going.

The final section of Chapter 3 on evolutionary routes to conflict resolution presents an array of nifty ideas. I was especially fascinated in the ways hierarchical patterns of conflict (e.g., within-group vs among-group) might influence evolutionary trajectories toward cooperation. Perhaps the coolest idea to me was that transition to higher levels of cooperation (e.g., from individuals to super-organisms) might pass through zones where the hierarchical level of conflict shifts upward to favor cooperation at lower levels. However, I am skeptical about some of the ideas. A problem in this chapter is the vague definition of conflict as a divergence of interest between players (a good example of where accessibility of the word without a clean definition can lead to some less clear thinking). The most misleading instance of this is when sexual conflict is described as different interests between males and females. The problem here is that males and females have the same fitness on average (assuming an equal sex ratio), so the wording is misleading. Conflict is much more subtle and has to do with two possibilities: 1. traits expressed in one sex (or role) vs the other, or 2. the effect of an advantageous trait in one individual on the fitness of its social partner (Westneat and Sih 2009). Conflict is never "resolved" if a new trait can give its bearer an advantage at the expense of others, but conflict may be quiescent if such traits do not appear. Why such traits do not appear is perhaps linked to some of the ideas presented in this section of the book, but this connection is not so clear. It seemed to me that the vagueness of the term conflict leads to some loss of clarity in this instance.

Chapter 4 begins with the compelling point that when organisms compete for resources, sharing them cooperatively may often be the best option. "Sharing" does not fully capture all the nuances of the idea, as that word implies a given resource that is divided, with everyone getting less. But, if cooperation allows either higher efficiency (lower costs) or synergistic benefits (access to more resources in total, such as through cooperative hunting of larger prey), then "sharing" may indeed be better than racing or fighting. The chapter emphasizes that sharing can occur in several ways, and, while the traits that produce sharing can be addressed by any of Tinbergen's four questions, here mechanism and function share the stage. The bulk of the chapter is devoted to three main functional explanations, reciprocity, kin-selected cooperation, and

coercive cooperation. I found the reciprocity section to be particularly stimulating in its integration of mechanism and function. The main functional issue is the probability of any aid-giving decision rule being "paid-back" in the future. That probability is affected by types of information about recipients (anonymous, partner-specific, and public), the ecological circumstances that affect interaction frequency and timing, and whether the mechanisms incorporate positive vs negative outcomes. That is, is the probability of you cooperating affected more by, say, a friend buying the first round (positive) or by you being stiffed on the bar bill at the end of the night (negative)? The kin-selection section also nicely integrates functional modifiers (e.g., inbreeding) with the mechanisms of various methods of discrimination. Finally, cooperation can also be coerced or induced surreptitiously, and conceptual theory on power is nicely presented along with numerous and diverse examples of coercive effects on cooperation.

The chapter is sprinkled with boxes that detail either interesting semantic debate (by-product mutualism), insightful additional mini-case studies (reciprocity in Norway rats), important conceptual vignettes (e.g., on conditions for reciprocity, biological markets), or useful mixes of the latter two (group augmentation and fitness, biological markets, alarm-calling, kin dispersal, paternal care and cannibalism, and punishment). Reading this chapter has encouraged me to rethink how I teach these topics and enriched my understanding of them. The chapter ends with a single paragraph devoted to what I think is probably the most pressing problem facing us today as we move forward. The chapter makes it clear that cooperation involves multiple traits, each of which have multiple types of fitness effects, with synergistic effects between traits both within and between social partners (e.g., Araya-Ajoy et al. 2020) and these all may depend on exactly how traits evolved in sequence. How do we integrate all of this into a coherent theory? The problem emerges implicitly in the book and the authors are clearly aware of it, but it remains to be addressed explicitly.

Chapter 5 focuses on special cases of race, fight, and share that occur interspecifically. It is a brief chapter that glosses over huge literatures (e.g., the ecological effects of exploitative competition) to focus on nuggets of special interest. Most of the chapter is devoted to cooperation, and of course, reciprocity receives the most attention. Some examples are quite cool. I was heretofore unfamiliar with goby-shrimp associations in which the shrimp build burrow complexes and the goby partner warns the shrimp of danger. The ecological conditions favoring pairs of bacteria species exchanging amino acids in the face of a non-cooperating competitor was also fascinating. Overall, the chapter establishes that some ideas applied to conspecific cooperation can usefully be extended to interspecific interactions. It did not, however, explore whether there are key differences in how such process play out conspecifically vs interspecifically. Thus, many may find this most useful as just a place to find cool examples.

Chapter 6 summarizes the main themes of the book. I found this chapter to be the most disappointing, as it

repeats the main ideas from the other chapters without adding much new. A small (2 pages) section on future directions does little more than lecture readers about relatively obvious things not to do (such as rely solely on Hamilton's rule) or take brief salvos at recent bandwagons (e.g., personality research) without much substance. An opportunity was missed to define the unanswered questions the authors find most compelling and forecast the most fertile approaches. Indeed, while unanswered questions emerge in many places in the book, an explicit focus on them might have been a powerful addition to each chapter.

Some final thoughts

This book is a necessary part of any behavioral ecologist's library. It contains a fresh approach to the topic with many thought-provoking ideas, some effective reviews of specific topics, and many excellent examples. It is too advanced for undergraduates but extremely well-suited for a graduate seminar course. Those leading a graduate seminar might take care to provide some additional materials or short context-building lectures, as there are some important ideas that are assumed here. A major one is the logic of game theory. Students who do not yet have an intuitive understanding of game theoretic thinking will struggle with this book. Another useful approach that is totally absent is quantitative genetics and the theory of indirect genetic effects. I can understand why it was omitted as the empirical contributions of that approach are relatively small compared to those stimulated by game theory, but there are some theoretical contributions that should be highlighted in any treatment of the evolution of social behavior.

Despite my occasional criticism, I highly recommend this book. The richness of empirical examples, the fresh organization of the scope of social behavior, and the clarity of the writing make this an exceedingly valuable contribution. Even when I disagreed or was disappointed, I found I was thinking about why in new ways. Any contribution that advances a reader's clarity of thought is a worthwhile contribution. Midway through my reading, I learned that E.O. Wilson had

passed away. I read his *Sociobiology: A New Synthesis* (Wilson 1975) when I was in college; it stimulated my interests in a way no other science book had before. Reading the present book thus took on a new perspective; I am amazed at how much we have learned since 1975 and how exciting our field continues to be. As Taborsky et al (2021) say at the end of the text, learning about the evolution of social behavior is a delightful challenge. I could not agree more. Enthusiasm about this challenge occurs in abundance throughout their writing and is reason alone to read this book.

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