

## NEWS

# Announcing the 2023 Journal of Experimental Biology Outstanding Paper Prize shortlist and winner

Kathryn Knight\*

Over the past 12 months, Journal of Experimental Biology has celebrated a century at the forefront of comparative physiology, neuroethology and biomechanics, reflecting on the past (Knight, 2023a; Knight, 2023b), while also looking to the future (Gilmour et al., 2023), and early-career researchers have been at the heart of our festivities. By launching the ECR Spotlight series (Franklin, 2023), we now provide early-career researchers with an opportunity to tell the community about their passions and interests, their current research and their ambitions for the future. JEB already has a lengthy tradition of supporting early career researchers, through our travelling fellowship scheme, launched in 1996, and the Outstanding Paper Prize, first awarded in memory of Bob Boutilier to Havalee Henry in 2005. And now that JEB's first centenary has drawn to a close, it is time to celebrate the contributions and innovations of the next group of outstanding early-career researchers recognised in the 2023 Outstanding Paper Prize shortlist. 'This award provides a wonderful opportunity to celebrate the exceptional research of early career researchers', says Craig Franklin, JEB Editor-in-Chief, adding that in addition to bringing diversity and fresh perspectives to experimental biology, 'Early career researchers are the pipeline of researchers for the future of our discipline'.

In the first of this year's shortlisted articles Jennifer Leestma and colleagues from Georgia Institute of Technology, USA, investigated how people recover their balance after a stumble, recording the positions of their feet and calculating how their bodies tipped after the researchers gave them a jolt in various directions at different points during the stride cycle ([jeb244760](#)). In her ECR Spotlight, Leestma says, 'We... found that humans are fairly precise in determining where they place their feet following a perturbation, but certain perturbation start times may limit the effectiveness of their step, likely because humans are limited in how quickly they can respond and move their limbs' (Leestma, 2023). Monitoring Editor, Monica Daley, who oversaw peer review of the article applauds the research, says 'The researchers were able to elegantly capture the balance responses to perturbations', and adds, 'The study is exceptionally thorough and rigorous and provides a rich open-source dataset'.

Continuing the biomechanics theme, Jarrod Petersen and Thomas Roberts from Brown University, USA, showed that muscle tissue is capable of behaving like a spring to store and release energy, potentially doubling the power it can generate ([jeb246070](#)). 'We found that subunits of a muscle-tendon preparation all contributed to power amplification, including the fibers, muscle belly, tendon and bone', says Petersen. Nominating the paper for the shortlist, Matt McHenry (who joined the editor team during the centenary year) says, 'I think it's a great example of how fundamental properties of

muscles are still being revealed, even with relatively simple experiments', adding that elasticity within muscle tissue itself can have a major impact on its contractile properties.

The concluding nomination from the field of biomechanics by Marco Graziano and colleagues from Memorial University, Canada, in collaboration with colleagues from University of East Anglia, UK, shows that the fluid released by spawning female salmon as they expel their eggs could help the strongest sperm to reach and fertilize eggs ahead of weaker sperm ([jeb244712](#)). 'The ovarian fluid gets thinner and thinner under increasing shear stress and this happens in ranges that are comparable to those acting on the fluid by sperm that are trying to reach the egg', says Graziano in his ECR Spotlight (Graziano, 2023). Recommending the paper as her selection for the shortlist, Sheila Patek (Deputy Editor-in-Chief) says, 'The paper is interesting and innovative', adding 'While this topic has been addressed previously in terms of the chemistry-related aspects of ovarian fluid and sperm behavior, I thought that the examination of the fluid mechanics properties was an unusual approach, but very relevant and important. I enjoyed how the authors adopted a multidisciplinary approach to testing their hypotheses, especially the integration of experiments and modeling'.

A series of four papers from the field of neuroethology is highlighted in the shortlist. The first paper, published in February 2023 by Amit Rana and Frederic Libersat from Ben Gurion University of the Negev, Israel, with Michael Adams from University of California, Riverside, USA, detailed how venom injected by jewel wasps into the cockroach central complex brain region leaves cockroach victims unable to move ([jeb245252](#)). Recalling the challenge of injecting three 9 nl doses of wasp venom directly into the brain of individual cockroaches while simultaneously recording electrical activity in the region, Rana says that overcoming this difficulty was the most rewarding aspect of his study (Rana, 2023). Reflecting on one of the final papers that he steered through peer review after 19 years as a Monitoring Editor, Ken Lukowiak says 'this is a great paper because the authors do a magnificent job of taking us through the whole process of how one creates a zombie in a stepwise and logical manner at the various neurophysiological levels'.

Almut Kelber's Outstanding Paper Prize nomination 'Artificial light impairs local attraction to females in male glow-worms' ([jeb245760](#)) attracted significant media attention with more than 250 news stories from across the globe. Lead author, Estelle Moubarak recalls, 'the most challenging part of working with glow-worm is the short time window that we have to study them because they are only active in adult form from June to August' (Moubarak, 2023). Describing how she, Sofia David Fernandes and colleagues used green LEDs to mimic female glow-worms to find out how light pollution affects the males' ability to track them down, Moubarak explains that the males were unable to locate the light mimicking the females as soon as the background light levels began to rise. 'The team did smart experiments to understand how light pollution influences mate detection in a bioluminescent species – both of

News & Views Editor, Journal of Experimental Biology.

\*Author for correspondence ([kathryn.knight@biologists.com](mailto:kathryn.knight@biologists.com))

 K.K., 0000-0001-5190-3152

### Shortlisted articles for the 2023 JEB Outstanding Paper Prize

- Alonge, M. M., Greville, L. J. S., Ma, X., Faure, P. A. and Bentley, G. E.** (2023). Acute restraint stress rapidly impacts reproductive neuroendocrinology and downstream gonad function in big brown bats (*Eptesicus fuscus*). *J. Exp. Biol.* **226**, jeb245592. doi:10.1242/jeb.245592.
- Chaves, J. N., Tattersall, G. J. and Andrade, D. V.** (2023). Energetic costs of bill heat exchange demonstrate contributions to thermoregulation at high temperatures in toco toucans (*Ramphastos toco*). *J. Exp. Biol.* **226**, jeb245268. doi:10.1242/jeb.245268
- Fontaine, S. S. and Kohl, K. D.** (2023). The microbiome buffers tadpole hosts from heat stress: a hologenomic approach to understand host–microbe interactions under warming. *J. Exp. Biol.* **226**, jeb245191. doi:10.1242/jeb.245191
- Graziano, M., Palit, S., Yethiraj, A., Immler, S., Gage, M. J. G. and Purchase, C. F.** (2023). Frequency-dependent viscosity of salmon ovarian fluid has biophysical implications for sperm–egg interactions. *J. Exp. Biol.* **226**, jeb244712. doi:10.1242/jeb.244712
- Leestma, J. K., Golyski, P. R., Smith, C. R., Sawicki, G. S. and Young, A. J.** (2023). Linking whole-body angular momentum and step placement during perturbed human walking. *J. Exp. Biol.* **226**, jeb244760. doi:10.1242/jeb.244760
- Moubarak, E. M., David Fernandes, A. S., Stewart, A. J. A. and Niven, J. E.** (2023). Artificial light impairs local attraction to females in male glow-worms. *J. Exp. Biol.* **226**, jeb245760. doi:10.1242/jeb.245760
- Pantoja-Sánchez, H., Leavell, B. C., Rendon, B., de-Silva, W. A. P. P., Singh, R., Zhou, J., Menda, G., Hoy, R. R., Miles, R. N., Sanscrainte, N. D., et al.** (2023). Tiny spies: mosquito antennae are sensitive sensors for eavesdropping on frog calls. *J. Exp. Biol.* **226**, jeb245359. doi:10.1242/jeb.245359
- Petersen, J. C. and Roberts, T. J.** (2023). Evidence for multi-scale power amplification in skeletal muscle. *J. Exp. Biol.* **226**, jeb246070. doi:10.1242/jeb.246070
- Pohlmann, J.-D., Pelster, B., Wysujack, K., Marohn, L., Freese, M., Lindemann, C. and Hanel, R.** (2023). Temperature and pressure dependency of oxygen consumption during long-term sustained swimming of European eels. *J. Exp. Biol.* **226**, jeb246095. doi:10.1242/jeb.246095
- Rana, A., Adams, M. E. and Libersat, F.** (2023). Parasitoid wasp venom re-programs host behavior through downmodulation of brain central complex activity and motor output. *J. Exp. Biol.* **226**, jeb245252. doi:10.1242/jeb.245252
- Talal, S., Parmar, S., Osgood, G. M., Harrison, J. F. and Cease, A. J.** (2023). High carbohydrate consumption increases lipid storage and promotes migratory flight in locusts. *J. Exp. Biol.* **226**, jeb245351. doi:10.1242/jeb.245351
- Venuto, A., Thibodeau-Beganny, S., Trapani, J. G. and Erickson, T.** (2023). A sensation for inflation: initial swim bladder inflation in larval zebrafish is mediated by the mechanosensory lateral line. *J. Exp. Biol.* **226**, jeb245635. doi:10.1242/jeb.245635

general interest and relevant for conservation. It was also one of extremely few papers that reviewers noted could be published as submitted', says Kelber.

Moving on from the impact of human activity on an insect species, Pat Wright's shortlisted nomination reveals how the mechanosensory lateral line of larval zebrafish contribute to their ability to achieve neutral buoyancy. In an elegant series of experiments, Alexandra Venuto (East Carolina University, USA), with colleagues from Amherst College, USA, and the University of New Brunswick, Canada, showed that the larval fish use the lateral line to detect when they have reached the surface of the water, allowing them to gulp sufficient air into their swim bladders to achieve neutral buoyancy (jeb245635). 'I was impressed that the authors used multiple

manipulations to alter the function of lateral line neuromast cells with very strong and consistent evidence that these cells regulate the initial filling of the swim bladder', says Wright, adding 'in deciding to follow up on that observation, Venuto and colleagues have discovered a very new role for the lateral line'.

The final neuroethology nomination, led by Hoover Pantoja-Sanchez while in Ximena Bernal's lab at Purdue University, USA, investigated how female *Uranotaenia lowii* mosquitoes use hearing to locate the barking treefrogs (*Dryophytes gratiosus*) upon which they feed, rather than listening for potential mates like other mosquito species (jeb245359). 'I thought this study was interesting not only because of the range of methods used to address the above question, but also because the biological phenomenon studied is so quirky. It reminds us that mosquitoes are important in contexts other than those related to human diseases', says Monitoring Editor Sanjay Sane, who oversaw peer review of the article, published in the final issue of the year.

Switching focus, the first of the Editors' nominations from the field of comparative physiology, published in 2023, was by Samantha Fontaine and Kevin Kohl (University of Pittsburgh, USA), discussing the protective role of the tadpole gut microbiome in heat stress after previous exposure to higher-than-usual temperatures (jeb245191). The well-prepared gut microbiome of tadpoles that had experienced higher temperatures protected the tadpoles from over-reacting to a later heatwave. 'This is a well thought out and beautifully executed study' says Monitoring Editor Trish Schulte, adding, 'the investigation generates new mechanistic insights and novel hypotheses about how the gut microbiome can mitigate the effects of environmental stress, which is critically important to our understanding of how animals will respond to climate change'.

In February, Stav Talal and colleagues from Arizona State University (ASU), USA, published their shortlisted discovery that migratory locusts (*Locusta migratoria*) charge the lipid stores that fuel their long-distance flights, by consuming a high-carbohydrate diet (jeb245351). Talal and Geoffrey Osgood fed the insect diets with high to low carbohydrate, before measuring their flight stamina. 'Six out of 34 locusts fed the high-carb diet flew continuously for 12 h', said Talal (Knight, 2023c) and the team realised that the locusts that had been fed a low-carbohydrate diet gave up flying before their fuel was exhausted, possibly to protect their energy reserves. 'Talal and colleagues are doing something a bit more unusual and special, connecting nutrition to dispersal energetics with some careful, innovative experimentation', says Monitoring Editor John Terblanche, adding that the team used a novel methodology to tackle this challenging question.

In addition to locusts, another migratory species, the European eel, made it on to the 2023 shortlist, with Stuart Egginton's nomination of, 'Temperature and pressure dependency of oxygen consumption during long-term sustained swimming of European eels' (jeb246095) by Jan-Dag Pohlmann, Constantin Lindemann and colleagues at Thünen Institute of Fisheries Ecology, Germany. 'This study is interesting', says Egginton, explaining that it attempts to address the age-old mystery of how European eels (*Anguilla anguilla*) complete their 5000–10,000 km odyssey to their spawning grounds in the Sargasso Sea without feeding. 'There are inevitable limitations in replicating such a biological feat in the laboratory, so kudos for attempting such a task', says Egginton, adding that the eels are even more efficient swimmers than had been previously thought.

Craig Franklin's nomination for the 2023 Outstanding Paper Prize shortlist, by Jussara Chaves and Denis Andrade (Universidade Estadual Paulista, Brazil) and Glenn Tattersall (Brock University, Canada) revealed that toucans lose heat through their beaks at high

temperatures to reduce their energy consumption; however, their impressive bills do not extend the temperature range over which the birds can live a comfortable low-cost life (jeb245268). In fact, the ability of the bird's ostentatious beak to absorb heat may even limit their ability to forage at the peak of the day, forcing them to seek shade when they risk overheating. 'This is a simple but elegant study', says Franklin, adding, 'It takes a classic Krogh's Principle approach in selecting a species apt for looking at a particular physiological mechanism, in this case the role the avian bill plays in heat exchange'.

In the final shortlisted article of 2023, Mattina Alonge (University of California, Berkeley, USA), Lucas Greville (University of Waterloo, Canada) and colleagues discovered that even one hour of stress was sufficient to impact the brains and testes of male big brown bats (*Eptesicus fuscus*), potentially affecting their fertility (jeb245592). In the Inside JEB article featuring the research, Alonge said, 'The short time frame of the gonadal response in *E. fuscus* is unprecedented in mammals, suggesting that bats are highly sensitive to acute stressors' (Knight, 2023d). Nominating the paper, Katie Gilmour said, 'This paper stood out for me for several reasons; the researchers' question focused on the mechanisms of how stress may impact reproduction and I loved that they looked at multiple levels of organization - they measured hormone levels but then used cellular and molecular approaches to assess responses in both the stress axis and the gonads. This was really nice work'.

Reflecting on the shortlist, Franklin says that it showcases a selection of the high-quality research published in the journal in 2023, adding that it was, 'tough whittling it down to these finalists, as there were so many excellent articles published by ECRs'. Having reviewed all of the 12 nominated articles, the Editors are delighted to announce that Hoover Pantoja-Sanchez and Brian Leavell (while at Purdue University) are joint winners of the 2023 JEB Outstanding Paper Prize for their paper, 'Tiny spies: mosquito antennae are sensitive sensors for eavesdropping on frog calls' (jeb245359). Reacting to the award, Principal Investigator Ximena Bernal says, 'I was thrilled to learn this news. It is an honour to get this recognition and I am particularly excited as this paper has some of my favourite components of doing science: it was led by young, bright investigators who were a pleasure to work with and it brings together different levels of analysis integrating natural history, behaviour, biomechanics and neurophysiology'. She also recalls how Pantoja-Sanchez initially joined her lab as an intern during his PhD in Colombia, visiting Cornell University, USA, with her and fellow graduate student Leavell to make preliminary measurements of the electrical signals produced by the antennae and their vibrational responses to specific tones. After Pantoja-Sanchez returned to Colombia, Leavell continued the project, filming the mating manoeuvres of *U. lowii*, before Pantoja-Sanchez re-joined Bernal's lab as a postdoc, working with Leavell to analyse the mosquitoes' courtship interactions. Pantoja-Sanchez then coordinated further neurological and vibrational recordings from the female insects' antennae, discovering how the females' hearing is tuned to the calls of barking treefrogs, rather than helping them to locate a mate. Leavell says, 'Working in the soundproof room where we measured the vibrational response of the antenna was undeniably a highlight. We were uncovering in near real-time that the tiny mosquito antenna had the physical potential to detect frog calls!'

Considering the recognition conferred by the award, Pantoja-Sanchez admits that he is overjoyed. 'Many people contributed to this study over several years', he says, adding that he had long admired Ronald Hoy, Ronald Miles and Bernal before they became his collaborators. And Leavell recalls that he was elated when he



Hoover Pantoja-Sanchez (left) and Brian Leavell (right) winners of the 2023 JEB Outstanding Paper Prize

heard the news, 'Hoover and I are good friends and spent a lot of time working together on this project, so it is extra rewarding to share it with him'. Having completed his research with Bernal, Pantoja-Sanchez is currently the Curator of the Environmental Sounds Collection at the Instituto Humboldt in Colombia, where he manages the acquisition, preservation and display of audio recordings of Colombian fauna, including birds, bats, frogs and crickets, as well as investigating the impact of human activities on biodiversity by examining the sounds produced by animals. However, he hopes ultimately to return to insect bioacoustics research. Meanwhile, Leavell is undertaking postdoctoral research at Boise State University, USA, where he is investigating how bat communities respond to wildfires and the impact of smoke on bat acoustics, with the long-term goal of a career in academia.

In view of the challenges faced by early-career researchers as they develop their careers, Franklin is proud of the support that the journal offers through the Outstanding Paper Prize and other outreach activities. 'These initiatives not only highlight the important contributions of early-career researchers but also provide them with a platform to gain recognition and connect with the broader scientific community. We are delighted to provide these opportunities and wish all ECRs that publish with the journal every success for the future', he says.

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