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CONVERSATION

JEB@100: an interview with Monitoring Editor Katie Gilmour

Journal of Experimental Biology is celebrating 100 years of discovery in 2023 and, as part of our reflections, we are inviting Journal Editors to tell us their thoughts about the journal and to look to the future. In this Conversation, Katie Gilmour, one of JEB's Monitoring Editors, tells us how she encountered the JEB Editorial team as a graduate student at the University of Cambridge, UK, and how she would like to have a Star Trek tricorder to monitor fish in the field non-invasively.

What is your area of scientific expertise and how did that introduce you to the Journal of Experimental Biology?

I consider myself a comparative physiologist who works primarily on fish; cardiorespiratory physiology, ion and acid–base regulation and stress physiology. But I came to know JEB well before I started doing research. I took a fourth-year environmental physiology course given by Chris Wood at McMaster University (Canada), which he taught largely from the primary literature. He would lecture and give us handouts of figures that were photocopied from research articles. The lectures worked us through these figures and a lot of them were from JEB, so I got to know the journal that way, and I read JEB papers for the lab reports. That was the starting point. Then I was a graduate student at the University of Cambridge, UK, where JEB was based in the Department of Zoology, and several people in the department were involved with the journal, such as John Treherne, who was the Editor-in-Chief, and Simon Maddrell, who was then The Company of Biologists' Financial Secretary. My supervisor, Charlie Ellington, became the Editor-in-Chief of JEB after John Treherne died. Many of the graduate students in the Department of Zoology also knew about JEB, because The Company of Biologists supported graduate students by paying them when their grants ran out to disassemble bound issues of the Company's journals and then staple individual papers together to produce reprints for the authors. As a grad student, you read JEB because it was the premier journal in comparative physiology. At that point it only came out once a month, so I got into the habit of scanning the journal then to see what cool new papers had appeared. I still have that habit today.

What do you think is the secret of JEB's longevity and success?

For me there are two things. One is that JEB attracts and publishes the best research in comparative physiology, people go to it for high-quality creative, mechanistic work. The other side is the community. Because people know that the best research is there, they tend to be very loyal to the journal, which invests back in people with things like its quality copy editing. JEB is one of the few journals that does it really well. Colour figures have always been free, they don't charge fees to authors, and they promote the papers that are published in the journal. JEB also rewards referees. They used to send a little check in the mail, although now those who referee frequently are given a free online subscription to the journal. When I first knew the journal, Margaret Clements was the sole Journal Administrator and she was always reassuring, helpful and kind. The same is true of the current team – they really go out of their way to help when asked. Those things have created an environment where JEB is very successful.

"Because people know that the best research is there, they tend to be very loyal to the journal"

What are the current big, outstanding questions in your field?

I think there are several areas of interest rather than an exclusive one. One is how to relate what's happening at the cellular and molecular levels to the whole animal; how activating or repressing a particular gene manifests in a phenotype. For example, if you expose an animal to an acid–base challenge, what is the stimulus that is detected and how does that lead to changes at the cellular and molecular levels that in turn allow the whole animal to respond to that challenge? We can measure changes in gene expression, but what does that mean to the animal? Then you can add in things like epigenetic mechanisms, how they factor in transgenerational changes. How does an event that happened at the parent level then translate to the next generation? We can see clues about what's happening by looking at molecular and cellular events, but putting that into a whole-animal context is still pretty difficult. At the moment, I see a lot of the questions in the field come up against these barriers between levels of organization.

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Where do you think the field of comparative physiology will be in 100 years?

At this point, I'm not sure whether my glass is half empty or half full. The half empty side of me worries whether things like AI are going to take over a lot of research and reduce human involvement. That's a concern. But on the positive side, something like AI modelling might be able to reduce the number of animals that we use by allowing us to take results from an animal in one situation and then accurately predict how it's going to operate in many more different situations: that's a glass-half-full kind of approach. To be honest, even though AI is pretty astounding at the moment, it is still somewhat limited, although it will continue to grow and learn how to do things. There is still going to be a need to look for interesting animals in challenging environments to see how they cope, to collect the data to feed into AI prediction programs – you need good data to put into AI in order to get a good response. I hope that AI will greatly expand the benefit of the research that we do on animals.

"On the positive side, something like AI modelling might be able to reduce the number of animals that we use"

If you could time travel, what piece of future equipment would you like to bring back with you?

I need a tricorder scanner from Star Trek; the scanner that Dr McCoy would put over someone and you'd get all the information about their health. It's totally non-invasive and would tell you everything physiological about the animal that you need to know. It would have to be slightly modified, because I'd want to put it on the animal in its environment, so I would have to catch the fish, attach this scanner somehow, maybe implant it if it's small, and then send the fish back out into the environment. Then I would know exactly where it is, the conditions it is experiencing – temperature, oxygen, CO_2, pH, ion levels – and how it is responding to those conditions. So, as temperature goes up, where does it choose to go and why? Is it moving there because of changes in its physiology or for some other reason, like it's gone to a zone with fewer predators? You'd have this all-inclusive data about an animal in its environment collected non-invasively.

"Then I would know exactly where it is, the conditions it is experiencing… and how it is responding to those conditions"

If you had one piece of advice to give to your past self, what would it be?

Looking back, I'd tell myself to take more molecular biology and coding courses. I avoided molecular biology as an undergraduate and graduate student, and I regret that; it would be so useful now. I would also encourage myself to be more creative. The current papers and researchers that really stand out for me are the ones that look at a problem and come up with a novel, interesting way of addressing it that advances the field. I don't know how you learn to be more creative, but I'd tell myself to focus on interesting and creative solutions to problems, rather than jumping on whatever solution is easiest, most practical and you can do right away, which may not give you the whole answer even though it gives you data that you can publish. But being creative is not easy. I don't think you can teach someone to be creative, it's got to come from within. But when you get the right mix of those things, a balance between practicality, common sense, focus and creativity, then you get great science.

"I'd tell myself to focus on interesting and creative solutions to problems"

If you had to sum up what JEB means to you, what would you say?

JEB is the place that I go to look for the most exciting and best quality research in my field. But coupled with that, comparative physiology is a discipline where there's a level of collaboration, collegiality, fun, wonder and awe, which is, to my eyes at least, missing from a lot of other research areas. For me, JEB encapsulates all of those things.

Katie Gilmour was interviewed by Kathryn Knight. The interview has been edited and condensed with the interviewee's approval.