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CONVERSATION

# JEB@100: an interview with Editor-in-Chief Craig Franklin

Journal of Experimental Biology is celebrating 100 years of discovery in 2023 and, as part of our reflections, we are inviting the Editors to tell us their thoughts about the journal and asking them to look to the future. In this Conversation, Craig Franklin, JEB Editor-in-Chief, tells us about his introduction to the journal as an undergraduate and imagines a piece of equipment that he would like to bring back from the future.


**What is your area of scientific expertise and how did that introduce you to JEB?**

I am an ecophysiologist or ecological physiologist and I ask questions about how animals function in changing or extreme environments. I'm interested in the plasticity and flexibility of physiological systems from a comparative perspective. I was introduced to JEB before my PhD, when I was an undergraduate. I took a course in comparative physiology at the University of Canterbury, New Zealand, where there were three comparative physiologists: Bill Davison, Malcolm Forster and Harry Taylor; their course was by far the most challenging in my degree. They introduced us to the field of comparative physiology and the people that featured in JEB, such as George Bartholomew, David Jones, Vincent Wigglesworth, James Gray, George Somero, Dave Randall, who became familiar names. Then, when I started my PhD, I discovered the work of Ian Johnston and I really started to pay attention to the journal. In those days you used to go to the library where there were hard copy versions of each issue of JEB. I would pick them up to read and flick through, and think, 'that's a really interesting topic, or animal, or question'. That's when I started to understand the breadth of the journal and it excited me. But I really immersed myself in JEB when I was a postdoc working under Gordon Grigg at the University of Queensland (UQ), Australia. The Biological Sciences Library at UQ had an area where all the journals were on magazine racks and it had lounge sofas that faced a big open window overlooking trees where you could sit. Every Friday, I went along for couple of hours and picked up the journals that interested me. You could sit there and read them like a magazine in a comfy chair; JEB always had that appeal. It was by far my favourite journal.

## I really immersed myself in JEB when I was a postdoc working under Gordon Grigg at the University of Queensland

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

There are a number of things. First and foremost, it's our community. JEB is renowned for its positive, inspiring, creative community. We're intrigued by the wonders of nature and biodiversity; we look at an animal and it makes us ask questions such as how it functions from a comparative perspective. We want to understand the physiological mechanism and that intrigues us. The success of the journal also comes down to the diversity of the organisms that we study, the array of physiological systems. When you meet JEB authors, they're enthusiastic, inspiring, encouraging and excited, which rubs off on us. It creates this amazing sense of community that you want to be a part of. That community includes our reviewers, our readers, our Editors, our Managing Editor and the production team. Each one plays a critical role, adding value to this phenomenon known as Journal of Experimental Biology. The personal touches are also so important. Margaret Clements, who was the JEB administrator until 2011, was remarkable and you developed a relationship with Editors. I hope this remains, that the Editors are approachable, that people feel that they can discuss their manuscripts with them, seek advice and that we're here to facilitate science and encourage people to do their best work. The other thing about JEB is the quality of the research we publish – simply put, it is outstanding and from my perspective it is by far the best journal in comparative physiology.

## JEB is renowned for its positive, inspiring, creative community

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**What are the current big outstanding questions in your field**

I'm particularly interested in the plasticity of physiological systems and I suppose that the big questions that are really fascinating me at the moment are associated with developmental plasticity, especially carry over effects – what happens early in life and how that manifests later. At the moment in my lab, we're particularly interested in carry-over effects in amphibians; what happens at the embryonic and larval stages and how that influences life after metamorphosis, especially if it is deleterious. Our research is currently looking at ultraviolet B radiation, which I think is an understudied pervasive stressor for many animals that can be damaging. Exposure in early life can influence your phenotype later in life. But we're not just looking at UV in isolation, rather the interactions with other environmental stresses. We want to understand how relevant our laboratory studies are to what happens in real life in the environment. We often run our experiments and make assumptions about how they translate to the natural world, and I think we can get it wrong. I'm very excited by physiological experiments that use mesocosms, small semi-natural environments that have a multitude of environmental factors that you can manipulate and see what happens. Currently on the roof of my building, we have about 24 round circular trays that are about 1 m diameter and filled with freshwater to about 30 cm deep; they are aquatic mesocosms. You put in plants, substrate and some trays have full exposure to sunlight while others have a film over the top, to limit the amount of UV. Then, you add your animals, cover the mesocosm with mesh so birds and aerial predators can't get in it and you have a functioning aquatic ecosystem. If it's set up right, you don't even have to feed the animals. This past season, my PhD student Coen Hird has been looking at the effects of UV on two species of frogs and placed early larvae into the mesocosms. We are interested to see if frogs that have metamorphosed from larvae exposed to full UV are more susceptible to chytrid fungus, a lethal disease of amphibians. From these experiments, you can infer physiological mechanisms to a degree, but then you have to go back into the lab to tease the mechanism apart, such as the immunocompetency of the frogs under varying levels of UV-B. I think there's enormous potential here.

**What impact will current research have in 50 years' time?**

Fifty years from now, we will have a better understanding of the sixth mass extinction event that we've created; which species will survive human-induced environmental change and which will not. Hopefully, we will also have a better understanding of the remarkable diversity of physiological systems and how this enables animals to function and survive in a variety of environments, especially changing and extreme environments. I hope that we will find species that are incredibly resilient to the extreme conditions that we have created; those are the animals that excite me most. We often talk about the doom and gloom stories of the impacts of climate change, but there are species that are incredibly plastic and resilient and I think they are even more intriguing. That's why I study crocodiles. They are the masters of dealing with environmental change. They are ∼70 million years old, they survived the extinction of the dinosaurs and they are here living today. What is special about their physiology, the way they function and their behaviour, that allows them to cope with challenging environmental conditions? They are thermally plastic, they are also fairly thermally insensitive and they can behaviourally and physiologically regulate their temperature, so they have three thermal strategies that they can use. I think they are remarkable and that there are going to be plenty more examples of species out there that will surprise us by their resilience. One of my more astounding discoveries was that Antarctic fish – which we regard as the archetypal stenotherm, thermal specialist – are phenotypically thermally plastic. The cardiovascular system can cope with increases in temperature and readjust, which surprised me. The species that we studied, *Pagothenia borchgrevinki*, live at the freezing point of seawater, –1.86°C, but you can heat them up to 4°C, give them a few weeks to acclimate and then they function equally well at 4°C as they do at –1.86°C. It was such an exciting discovery and I made it together with my PhD supervisor, Bill Davison, and a really good friend and colleague, Frank Seebacher, down in Antarctica in 2005. We didn't think they were going to be thermally plastic, but we showed that in many regards they are eurytherms.

## We will have a better understanding of the sixth mass extinction event that we've created

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

I hope it won't have changed that much, that the community will still be intrigued by the biodiversity on this planet, that we will be asking mechanistic questions that are driven by curiosity. But I think we will have evolved in terms of where we have impact, where our science is relevant and applicable. I think that we will have greater partnerships outside our traditional community, partnerships with philanthropists and NGOs that will recognise the significance of our work and the serendipity that can come from the discoveries that we make. You can never predict or understand how curiosity-driven research can have an influence in the future and I'd like to think that our impact will increase with the discoveries that are published in JEB. I think that the Krogh Principle will have even greater relevance as technology advances, that our concept of a model organism will disappear. Currently, we have four or five model organisms. In the future, the range of model organisms could expand to hundreds of species because of the work that is currently being published in JEB. That idea excites me.

## I think we will have evolved in terms of where we have impact, where our science is relevant and applicable

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

I'd like to have devices that allow us to look at the physiology of organisms in the field in more depth, that allow us to manipulate the physiology of animals and run experiments. If I could bring that piece of equipment back with me from the future, I'd follow the respiratory cascade of crocodiles, measure all aspects of it from oxygen transport through to the mitochondria. That would be remarkable. I really want to know more about what's happening when they do 8 h dives. What is happening with their physiology? What allows them to sustain a dive of that duration? For me, that would be fascinating.

**What does JEB mean to you as an author and a researcher?**

That comes back to our community; how it is diverse, inclusive, supportive, encouraging and excitable. We like having fun with our

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science, we love sharing our science and we do that in JEB. I've met some of the best people throughout my career. In my early days they were my mentors and people who inspired me. These days, I look at the young scientists that are coming through and they inspire me too. We have a sense of responsibility to document the wonderful diversity of life on this planet and all the physiological systems that have evolved to cope with a range of conditions, that allows life to live from the poles to the deserts and the mountains to the deep oceans.

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