

NEWS

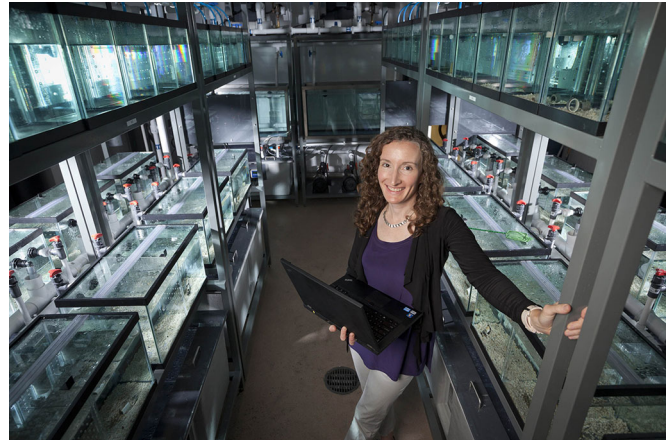
Sheila Patek joins JEB editorial team

Kathryn Knight*

For many scientists, viewing the Table of Contents of a new journal issue for the first time is a moment of exquisite anticipation. Fresh publications reveal novel developments and discoveries that stimulate our imaginations and throw wide-open new concepts to stimulate discussions that had previously been confined to small communities of collaborators. Every new issue is also the culmination of a considered collaboration between the Editors of a journal and the referees, who generously give their time to ensure the sustained quality of the peer-review process. With over 1200 manuscripts per year to shepherd through the rigorous peer review that is the hallmark of JEB, Editor-in-Chief Hans Hoppeler recently added a new Editor to the current team of nine: Sheila Patek from Duke University, USA, will join co-editors Andy Biewener and Michael Dickinson in the burgeoning area of biomechanics. Patek's 15-year history of publishing in the journal, in addition to her proven track record of high-quality research, makes her ideally positioned to take on a role at the journal. 'JEB has been my home journal for my entire career', says Patek, adding 'It was something I wanted to say "yes" to whole-heartedly'.

As an established scientist, Patek has a passion for understanding aquatic lifeforms. Growing up in New York State in a small community about an hour out of the city, Patek recalls how her parents were always 'outdoorsy' and fascinated by the natural world. 'If I was interested in something they would do what they could to make that possible', says Patek, describing how her father introduced her to numbers and spreadsheets from an early age. 'We even had one of the earliest home computers, which was just a tape player', says Patek, who enjoyed playing the primitive computer games available at the time, in addition to learning to write simple programs in Basic. With a swamp at the back of the house and a pond across the road, Patek recalls that there was no end of questions to stimulate her curiosity, and she recalls, 'very early on I wanted to be a scientist, I wanted to work on organisms, I wanted to understand how things work'.

Moving to Cambridge, Massachusetts, as a Harvard undergraduate, Patek remembers the frustration she experienced while searching for an intriguing subject to inspire her. 'I kept on trying different things', she says, recalling how difficult it was to contact professors in the pre-internet world. 'I couldn't even get profs to answer me, and the ones who did still stay with me. I feel grateful, even now, for those folks who were willing to open their doors to me', she says. Even course registration was not assured for many classes and she often had to apply just to be accepted. However, when Patek discovered and applied for the ichthyology class taught by Karl Liem, she had a sense that her luck was about to change. 'I had a feeling this was going to be the one that could help me launch this career', says Patek, who has never forgotten her excitement when she received the phone call in her dorm telling her that she could enrol. During the class, Patek selected a project on



Sheila Patek surrounded by tanks of mantis shrimp at Duke University. Photo credit: Jon Gardiner/Duke University Photography.

fish swimming, mentored by Beth Brainerd, who was then a postdoc with Liem, and her fate was sealed. 'She [Beth] was, and still is, one of the most amazing mentors in this field', says Patek, remembering how, in addition to guiding her through her first study of fish swimming, Brainerd also helped her reconcile her other great passion – music – with her love of science. 'I played clarinet and piano, primarily clarinet, all the way through college in Harvard-Radcliffe Orchestra – the University's premiere orchestra – and it was very difficult for me to accept that I could not do both', says Patek, until Brainerd suggested that Patek focus on biological acoustics.

While working as Brainerd's first laboratory manager at the University of Massachusetts, Patek applied to join Steve Nowicki at Duke University as a graduate student to study sound production in animals. 'Steven Vogel, Stephen Wainwright and Knut Schmidt-Nielsen were all there, so I walked into this heyday of organismal biology and biomechanics for my PhD', muses Patek, who began investigating how spiny lobsters produce sound when they rub their antennae against their heads. Scrutinising the animal's morphology, Patek discovered that the crustaceans were using a stick-slip friction mechanism – where a rubbery surface moves over a smooth surface like a finger dragged across the surface of a balloon. 'This is one of the ironies of this discovery: that kind of sound is everywhere; it is a squeaking door and in fact it is also similar on a different scale to how many earthquake faults operate', she says, adding with a laugh, 'I had stumbled across what is a very vibrant field'.

Yet it was unclear how much of their own performance the serenading lobsters could hear. Accepting a Miller Institute Fellowship to join Roy Caldwell at the University of California, Berkeley, USA, Patek turned her attention to the search for the elusive mantis shrimp ear. However, the mantis shrimp were less cooperative than the spiny lobsters, leaving the mystery unsolved to this day. Falling back on her favourite rule of thumb – you have to study what the animal does all the time – Patek decided to switch her

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attention to the crustacean's smashing action. Mantis shrimp hunt by bludgeoning their prey with a hammer-like appendage – they are even known to smash their own tanks – so when a BBC film crew passed through Berkeley on the lookout for intriguing animals to film, Patek had the ideal opportunity to capture the high-speed assault in fine detail. She struck a deal where the film crew recorded the belligerent crustaceans for their show and, in return, allowed her to analyse footage of the explosive attack. Patek recalls how they played back the first movie in slow motion: 'We knew immediately that we had made a discovery', she says, describing how they saw the cavitation bubbles that are formed as the shrimp's hammer essentially splits the water apart to deliver a second shattering blow as the bubble implodes. 'Even a back-of-the-envelope calculation for the speed and acceleration of the strike put them right at the outer limits of what people had ever seen', says Patek, adding that the acceleration is on the order of a bullet fired from a gun. Eventually, she went on to measure the force of the extraordinary impact. 'Mantis shrimp don't care how fast they are moving... they care about the force coming out of the hammer', says Patek, who eventually recorded that the incredible crustaceans are able to pulverise their prey with a 1500 N impact – equivalent to more than 2500 times the animal's own weight.

By now, Patek had been hired as a faculty member by UC Berkeley, but without a similar offer for her husband – the evolutionary anthropologist Charles Nunn – the couple were forced to make a painful decision. 'He and I are both very ambitious individuals, so eventually he took off to take a position at the Max Plank Institute in Leipzig, Germany'. This meant an 11,000 mile round trip to see one another at the time of the birth of their first

child. So when Nunn was finally offered a tenure-track position back in the US at Harvard, Patek returned to the University of Massachusetts where she had begun her research career, but this time as an Assistant Professor. 'The University of Massachusetts was absolutely outstanding for the evolutionary approaches to morphology and biomechanics... I loved it there', smiles Patek. But when a tenured position at Harvard failed to materialise for Nunn, the couple decided to up sticks yet again in search of faculty positions at the same institution: 'We went on our 13th year of looking for two jobs in one place', sighs Patek, until Duke University enticed them both to return to their alma mater in 2013. Since joining the Biology Department, Patek has been able to continue indulging her twin passions for fast motion and interdisciplinary research. 'We have been working very hard in the lab to bring a deep conceptual and quantified foundation to biomechanics that is based in evolutionary thinking', says Patek, who also aims to unify the biology, maths, physics and engineering that underpin lightning-fast biological movements in order to better understand this extraordinary realm.

Looking forward to joining the team of Monitoring Editors at JEB, Patek says, 'I love the enthusiasm around all the different ways JEB recognises the work of the authors', and is looking forward to fully engaging with the peer-review process; 'It gives a deeper lens on what is happening in the field', she explains. Hans Hoppeler is also keen to welcome Patek into the team, saying, 'She is first and foremost driven by scientific curiosity, and her interdisciplinary approach embodies what JEB stands for, which is providing novel insight into how species solve difficult physiological problems to survive'.