7,000 bears living in and around the Carpathians.

As the bears opportunistically eat almost any food that comes their way and aren't afraid to approach human settlements, livestock depredation is a concern where humans and bears share the landscape. Mihai Pop from the University of Bucharest, Romania, and colleagues recently analysed factors associated with livestock predation attributed to bears (Conserv. Sci. Pract. (2023) https://doi.org/10.1111/csp2.12884).

Since Romania banned trophy hunting in 2016, there has been a perception that both bear abundance and the frequency of predation incidents are increasing. Therefore, Pop and colleagues propose their analysis of causes as a tool for bear management plans that could help to keep the losses down. Their suggestions include both changes to livestock management and the elimination of "problem bears", i.e. repeat offenders that may have taken a habit of dining at farmers' expense. The authors conclude that "continuous monitoring of bear-caused predation, along with a science-based evaluation of brown bear density and habitat selection is key for sustainable management of Europe's largest brown bear population".

Here, as elsewhere, part of the problem is that media and public opinion may not be inclined to listen to ecologists and conservation experts. In a recent study of media coverage of brown bears in Romania, Andra Claudia Neagu from the University of Bucharest and colleagues found that coverage since the 2016 hunting ban was increasingly negative and designed to stoke fear (Nat. Conserv. (2022) *50*, 65–84). In most cases, it also failed to consult the views of any biology experts.

The underlying image problem is the same that carnivores face in other regions as well, and which conservation work has to address: a mixture of ancient fears, actual economic damage, and a lack of appreciation of the important role these species have to play as keystone species in restoring ecosystems.

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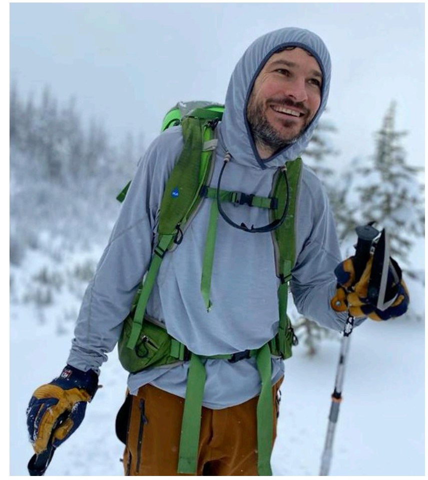
Q & A

John Tuthill



John Tuthill is an Associate Professor of Physiology and Biophysics at the University of Washington, in Seattle. John grew up in a small town in Maine. He was an undergraduate at Swarthmore College, completed his PhD studying visual motion circuits in the Drosophila *brain with Michael Reiser at Janelia, then did a post-doc on neural mechanisms of touch processing with Rachel Wilson at Harvard Medical School. In 2016, he started his lab at the University of Washington, where he and his colleagues use electrophysiology, optical imaging, and behavioral analysis to investigate how the fruit fly brain keeps track of the body, through the sense of proprioception, and how proprioceptive neural signals are used to guide motor patterns like walking. He is a recipient of the Pew Biomedical Scholar Award, Searle Scholar Award, Sloan Fellowship, Klingenstein-Simons Fellowship, McKnight Scholar Award, and is a Robertson Investigator of the New York Stem Cell Foundation. Learn more about the Tuthill lab at tuthill.casa.*

Did you always want to be a scientist? No. As a child, the only scientific inclination I had was a mild interest in rocks, seeded by my father, who came from a mining family in the upper peninsula of Michigan. He worked in a uranium mine in New Mexico until I came along, at which point my parents moved to a small town in central Maine, where my mother is from. She was a teacher. I was an only child in the middle of nowhere, so I spent a lot of time wandering through the woods, mumbling to myself. On the weekends, my dad would take me to explore abandoned tourmaline mines and we would pan for gold in streams. But it was not until much later that I learned one could do this kind of exploration as a job.

How did you become interested in neuroscience? I was lucky to get a scholarship from an eccentric finance billionaire to attend Swarthmore College. A couple of years in, I was majoring in anthropology and working on a film about the dialectics of junkyards, when I had a serious, nearly life-threatening, accident. I was building an ice fishing shack on a frozen lake when a table-saw tipped over, severing my right thumb. It took several surgeries and a year of physical therapy to get my thumb properly reattached and passably functional. To this day, it is still chronically painful and tingly. In the aftermath, I was taking a lot of opiates to dull the pain, and occasionally hallucinogens to sharpen my mind again. I was also learning to write with my left hand. I think it was the massive physiological shock, and all the neurological changes that followed, that drew me toward neuroscience. When I returned to college for the spring semester, I enrolled in two classes that changed my life: Neurobiology, taught by Kathy Siwicki, and Marine Biology, taught by Rachel Merz. I then became fixated on the intersection of these two subjects: specifically, the sensory neurobiology of animals in the deep sea.

My undergraduate advisor, Rachel, sensed my interest in this topic and put me in touch with Sönke Johnsen, a former student who is an expert on the sensory ecology of deep-sea animals. Sönke offered me a position in his lab at Duke for the summer and Rachel found a grant to support me. When I showed up, Sönke asked me what I wanted to work on. I was surprised by how open-ended it was, like I could have chosen dark matter or optimal firewood stacking patterns. I settled on polarization vision because it seemed so abstract and psychedelic that animals could see a property of light that is invisible to us.

I built an apparatus that accelerated a transparent object toward a crayfish relaxing in a tank; on some trials, the object was linearly polarized and on others the polarization was scrambled. When the object was polarized, the crayfish would reliably jump away — it was obvious that they could see it. This suggested that crayfish can use polarization to improve their ability to detect moving objects, which would be useful, for instance, if you wanted to detect shiny fish predators in a murky stream. Later, Sönke also got me a berth on a research cruise in the Gulf of Mexico, where we trawled for deep sea crustaceans and recorded the flicker-fusion frequency, or frame rate, of their vision. These experiences opened my eyes to the practice and culture of science, and I began to think there could be a place there for me.

Did you go straight to graduate school after college? No, when I graduated from college, I moved to Missoula, Montana with a group of friends. My mentors, Rachel, Kathy, and Sönke, had all encouraged me to pursue a PhD, but science still felt somewhat lofty and impractical. I had some woodworking experience, so I found work in Montana as a cabinet-maker. It was a good job, but the workshop radio was tuned to a country music station (94.9 KYSS FM) that played the same painful pop country songs all day. I would leave the planer running to drown out the music, but then someone would turn up the radio so that Tim McGraw or Carrie Underwood could still be heard over the din. It was agonizing. A couple of my friends were doing plant genetics research in Lila Fishman’s lab at the University of Montana. They convinced Lila to hire me part time and the next day I quit the cabinet-making job. I was back on the biology train, this time studying population genetics in monkeyflowers, which allowed me to work in the greenhouse or at the bench and listen to good science music, mainly old episodes of my favorite radio show, Chances with Wolves.

After Montana, I went to Buenos Aires to follow up on my undergraduate crayfish polarization project. In Argentina, I worked with Daniel Tomsic, who is part of a tight-knit group of neuroscientists who all study a little mud-flat crab called *Chasmagnathus*. I tried to repeat my behavior experiments with these crabs, but failed, and then moved on to doing electrophysiological recordings from crab neurons while showing them polarized visual stimuli. Like many labs in Latin America, the crab lab was short on funds, so I supported myself by writing inane articles for woodworking websites. The thing I learned from my time in Argentina is how constraints — funding, space, and so on— can be overcome with ingenuity and community. From the perspective of scientific resources, my next stop, as one of the first graduate students at HHMI’s then brand-new research campus, Janelia, was the opposite. At Janelia, we were provided with amazing facilities and vast resources, which created a sense of freedom to take chances and pursue big ideas. Although it might not be the right environment for everyone, I found Janelia to be an invigorating and fun place to be a PhD student.

Why did you choose to study the brain of a fruit fly? I initially chose *Drosophila* because I thought its brain was of a tractable scale that it could be ‘solved’ within a reasonable timeframe. However, after more than a decade of studying fly neural circuits and behavior, I am now not so sure. Flies have been around in some form for about 260 million years, which means that evolution has had billions of generations to tinker and compress. As a result, the complexity of the fly nervous system, in terms of computational capacity per unit volume, is massive. Although its brain is smaller than a sesame seed, a fruit fly can navigate through a perilous, unpredictable world, evading dragonflies to find your banana, then tussling with competitor flies, charming a mate, procreating, and keeping the whole cycle going. A fly may have fewer than 200,000 neurons, but these include thousands of specialized cell types, many of which are highly compartmentalized so that a single cell can perform multiple computations in parallel. I think we are making tremendous progress as a field on understanding how specific microcircuits or behaviors operate, but there is still a lot left to be learned from the fly brain, particularly how all the different modules work together.

What do you enjoy most about your work as a neuroscientist? The feeling of awe. I feel awe when real life verges on the magical, by bending my assumptions or defying my intuition of reality. This often happens at unfamiliar scales, like being among huge, glaciated mountains or closely observing the dexterity of a small, fast-moving insect. Santiago Ramón y Cajal wrote that the insect brain gave him the “terrifying sensation of the unfathomable mystery of life”. I feel similarly, but do my best to enjoy the mystery.

Do you consider awe the purpose of your work? I would prefer to live in a society that places intrinsic value on the sublime, but we are unfortunately a ways off from that. The reality is that basic science is transactional: there is a chance that the discoveries we make will someday be useful, in a market sense. Studying fly brains provides a compromise between pursuing a question I find inherently fascinating and one that is financially sustainable due to its perceived utility. A big part of my job is articulating that utility to acquire funding for my lab. I don’t mind writing grants, it is often a useful scientific workout, but ultimately I would be satisfied if the knowledge we produced had no market utility other than the satisfaction and wonder that comes from knowing how the fly brain senses and moves its body. And I think funding agencies would be wise to let scientists pursue their own personal senses of wonder and curiosity, because that is where true discoveries come from.

Another reason it is important to study the brains and behavior of other animals is to chip away at human exceptionalism, which I believe is among the root causes of our current environmental crisis. The notion that humans sit at the apex of a cognitive and evolutionary pyramid is deeply ingrained within both our society and the scientific community. Certainly, there are things that humans excel at. But because we are human, these strengths then provide the ruler by which we measure the intelligence, complexity, and value of other organisms. We use these circular value judgments to justify callous treatment of animals and the natural world in general. I am supportive of recent efforts to extend legal rights to animals and even ecosystems. Martha Nussbaum's recent book, *Justice for Animals*, provides a good primer on this argument. Some real-world examples are the Chilean constitution that was proposed last year (though it was ultimately voted down in a nationwide referendum) and the lawsuit filed on behalf of a threatened lake in Florida (which was unfortunately tossed out by a judge). I am optimistic, probably naively so, that this may signal the start of a new conservation movement that can transcend the stale economic arguments that have been failing to prevent environmental destruction for the past fifty years. I think biologists have an important role to play in advocating for the fundamental rights of other organisms and ecosystems.

What one piece of advice would you give to young scientists? My advice to grad students and post-docs is to have a secret project. Don't tell anyone about it, especially not your advisor. It is acceptable, and maybe even a good idea, to have collaborators, but they must also be sworn to secrecy. The secret project shouldn't consume too much time, maybe just a few hours a week. It can be related to your main project or something really far out, it doesn't really matter. The point is that you are the only one who knows about it, and you can choose if and when you tell other people about it.

When I was a kid, I had a secret tree, a big white pine, in the woods behind my house. I would often sit under that tree and read or mumble to myself and think about its secrecy. I only just recently shared it with someone else, when I took my 6-month-old daughter to visit the secret tree last summer.

So what is your secret project? If I told you, it wouldn't be a secret. But I can tell you about an older secret project that has gone public. A few years ago, I became fascinated by snow flies (*Chionea*), a remarkable group of flightless flies who live in high alpine regions of the Pacific Northwest. I first noticed a snow fly one day when I was out skiing on our local volcano, Mt. Rainier. It was probably 10 degrees out, snowing and windy, not exactly hospitable conditions for a cold-blooded insect, but the snow fly was just jauntily sprinting across the snow like it was headed to the bar after a day in the mine. It seemed that this animal was simply ignoring the standard thermodynamic limits of biology. For example, neurons typically lose their ability to transmit electrical signals when the temperature drops below freezing. So snow flies either have to raise their internal body temperature, like a mammal, or they must possess adaptations that allow their neurons to operate at temperatures that paralyze other animals. We are currently working to unlock the snow flies' secrets to extreme cold tolerance by studying their behavior and physiology in my lab (snowflyproject.org).

How do you chill out after an intense day of feeling awe and keeping secrets in the lab? Running and reading. Talking about running can be tedious, so I'll just explain why reading is important to me. When I was a kid, my mom established a routine that we would read a book together every night at bedtime. This habit has stuck with me — I still read every night before going to sleep, for at least an hour, mostly fiction, but sometimes narrative nonfiction and longform journalism. Reading is a great way to escape, but it is also how I assimilate new concepts. I know many scientists are visual or mathematical, and I can do bits of both, but for me, the most transformative scientific moments all involve words, read or written.

What are some books that have influenced you? There are a few writers who, although their writing is never directly about science, apply a type of scientific method in that they pull on tufts of loosely connected threads and see what spirals out. Two examples are Roberto Bolaño and Joy Williams. The characters in their books are intensely engaged within their specific worlds, but the meaning of their lives is often obscure, somewhere between unsettling and profound. I have gradually realized that this is also my scientific style. Not every project or paper can or should be *The Great Gatsby*. I am most comfortable when I have a general sense of where I am going but no idea of my specific location. This is maybe also why I prefer bushwhacking and ski touring over hiking on established trails or riding chairlifts.

What are your views on the changing nature of scientific publishing? I started my lab just as bioRxiv was taking off, in 2016. We have posted every paper as a preprint prior to submitting it to a journal. I have a bioRxiv bumper sticker on my car, which Leslie Vosshall sent me after I posted my lab's first preprint in 2018. These days, I read far more preprints than post peer-review papers. I think that the preprint revolution has had a tremendous positive benefit for me and my lab. In addition to speeding up the pace of scientific communication, I find that sharing our work with the world pre-publication ameliorates the psychological gauntlet of peer review. I now feel a greater sense of accomplishment when a preprint is posted than when a paper is published. When I receive a set of negative reviews, it provides some consolation that they do not prevent the broader scientific community from accessing our work.

Even with preprints, our current publishing system needs reform. In my opinion, a lot of effort is wasted trying to pigeonhole scientific results into short format, high 'impact' papers within a small number of glamorous journals, and resources are wasted on the other end in paying big publishers for the prestige of publishing in their journals. I am enthusiastic about initiatives to revise the system, like *eLife*'s experiment of eliminating final publication decisions. I hope there will also still be a place for institutions like *Current Biology*, who select eclectic papers for peer review and provide a service to the community by commissioning and publishing articles like this one. However, I think there is a pressing need to overhaul the journal 'impact' prestige hierarchy. My view is that, as humble scientists, we should recognize that we are unable to effectively predict future impact, and it has no place as an evaluation criterion in peer review.

What is another aspect of scientific culture that you feel requires change? Mental health illiteracy. Scientists, especially those who study the brain, should be leading the way in establishing a work culture that cultivates positive mental health. However, the rate of severe depression and anxiety is eight times higher among graduate students than the population average. I have lost several friends and colleagues to suicide. Mental health issues are a systemic problem in science and higher education in general, and I feel that it is our responsibility to address them. A first step in fighting this epidemic is building mental health education into our scientific training. One organization that is doing great work in this vein is Dragonfly Mental Health — I encourage faculty and trainees to check out their programs (www.dragonflymentalhealth.org).

How do you feel like you have changed since the beginning of your scientific career? I don't think I have changed very much, but my situation and priorities have. I am a couple of years away from being 40. I have an amazing wife, a hilarious daughter, and a reliable paycheck. I feel like I now have the space, and the desire, to focus less on my own interests and give more to others. In the lab, my top priority is mentoring trainees, trying to help them find their own sources of inspiration and achieve their own goals. Often our interests overlap, and we can work together on a common scientific pursuit. But I am also learning to relish the junctures, trying to help students and post-docs go in directions I wouldn't necessarily choose. I like working with collaborators and trainees from diverse scientific and personal backgrounds, whose perspectives are fundamentally different from mine. I feel like my job is to create a lab environment and a system that is set up for people to thrive. Mentoring is challenging, but it can also be rewarding. I felt very proud when my first post-doc recently left to start her own lab. Among the many things about me that have not changed, one is that I don't feel much joy after personal accomplishments, but I do enjoy seeing others close to me succeed.

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Book review

Fighting for the future

Dale Jamieson

The New Climate War: The Fight to Take Back Our Planet
Michael E. Mann
(Public Affairs Press, New York; 2021)
ISBN: 101-5-417-5823-4

Anthropogenic climate change is a fact, not just a 'theory'. Yet like evolution by natural selection, it has its deniers. But whereas evolution deniers tend to be cranks and fanatics, climate-change deniers are often highly paid professionals who are indifferent to the truth and backed by the power and resources of major corporations. The source of this book is in one scientist's confrontation with this power.

Michael Mann's career began in a way that is familiar to most scientists: undergraduate degrees in physics and applied math at Berkeley, followed by graduate studies in physics at Yale. He discovered climate science relatively late in his graduate career and switched to geology and geophysics where he felt he could make a more significant contribution. He defended his dissertation in 1996 and, after a stop at the National Center for Atmospheric Research, took up a post-doc at the University of Massachusetts. He formally received his degree in 1998 and the following year published the paper that would change his life[1].

While at the University of Massachusetts, Mann worked with climatologist Raymond Bradley, who specializes in climate variability. Together with ecologist Malcolm Hughes, who uses tree-ring data to analyze past climates, they were able to spatially resolve global reconstructions of annual surface-temperature patterns for the Northern Hemisphere over the past six centuries. They showed that greenhouse gas concentrations were the dominant twentieth-century 'forcing' and concluded that "the 1990s are likely the warmest decade, and 1998 the warmest year, in at least a millennium"[1]. The paper included the 'hockey stick' graph (so dubbed by Jerry Mahlman, who was then Director of NOAA's Geophysical Fluid Dynamics Laboratory), which has become iconic in the climate change discussion. The graph was featured in the 2001 United Nations Intergovernmental Panel on Climate Change report (Figure 1A), and in the 2021 report it was extended to encompass two millennia, showing that the warming identified by Mann and his collaborators is a global phenomenon (Figure 1B). The original paper appeared in *Nature* on Earth Day and was covered by major newspapers and media outlets. Soon Mann was the object of death threats, government investigations, threats to his job, and attempts to withhold funds from his university.

In the first chapter of this book Mann locates the roots of the climate war in the disinformation campaigns waged decades ago against pesticide regulation and tobacco control. In Chapter 2 he tells the story of the climate war through his own experiences. Chapters 3 and 4 describe the various strategies corporate actors employ to turn attention away from the need for collective action, such as 'deflection' campaigns, which seek to shift responsibility for environmental harms from producers to consumers. In Chapters 5 and 6, Mann argues for the importance of pricing carbon and discusses campaigns to discredit alternatives to fossil fuels. Chapter 7 critiques 'non-solutions' such as natural gas, carbon capture, and geoengineering. In chapter 8, Mann criticizes those who exaggerate the climate threat, and in Chapter 9 he explains why he is "cautiously optimistic" (p. 225).

Mann is serious when he refers to the current situation as a climate 'war'. He writes "I have colleagues who have expressed discomfort in framing our predicament as a "war." But as I tell them, the surest way to lose a war is to refuse to recognize you're in one in the first place" (p. 7). Wars require soldiers who march to the same drum. Mann criticizes advocates of individual action such as "vegan activists who are convinced that meat-shaming is the solution to climate change" (p. 78), those who criticize green celebrities such as Leonardo Di Caprio for hypocrisy, those who think that sacrifice is inevitable in addressing climate change, advocates of the Green New Deal who link climate change to a portfolio of progressive