that, due to mutations, vary between individuals.

Linden explains that, "when we taste bitter plants […] we're bystanders in an ongoing chemical war between plants and insects". Plants resist insects by producing unpalatable, toxic chemicals that vary widely in structure. Therefore, humans, also needing to reject some of these chemicals, require diverse protein receptors to detect them. Consequently, certain individuals with one or more mutated bitter receptor may not notice the repellant tastes in broccoli, whereas other individuals are disgusted. Some individuals love anise, basil, and mustard, whereas their partners may be unable to taste them at all or — like bugs in the 'bitters war' — are repelled.

Olfactory receptors are even more diverse. Each of us expresses roughly 400 genes for proteins that bind specific chemical groups on volatile compounds, but 30% of these genes differ between any two random individuals. So we may all smell good, but we don't smell the same.

Linden holds his fire for 130 pages, skillfully summarizing data and vividly teasing out the framework for understanding subtle ways in which we are each unique in sensory experience, sleep, sex, gender, and attraction to others. Then in a passionate moment, he sweeps back his wizardly curtain to write, "here's what I believe with all my heart". He explains that, wherever the science may lead, and whatever biological differences humans might present across sex, gender, orientation, and so on, he *holds a moral conviction* that we are all equally entitled to environments that allow us to realize our genetic potential. This is what we want from an investigator: intellectual clarity about the science and moral clarity regarding the opportunities due every individual.

Linden's last chapter treats the most fraught topic of all: 'race'. We often read that race is not a biological category but rather a 'cultural construct'. But what does that really mean?

Here's the broad point. Because we tend to mate with our neighbors, simple traits governed by a few genes with large effects are rapidly selected by the local environment. Weak sunlight soon selects a few genes for pale skin, high altitude selects a hemoglobin gene for low-oxygen tension, and malaria selects a hemoglobin whose single altered amino acid causes red blood cells to better resist infection. However, *complex* traits, such as general intelligence as measured by IQ score, creativity, musicality, and athleticism, are governed by hundreds to thousands of genes, each with small effect. These traits are not selected by any specific locale: rather they contribute to our brilliance as a species that thrives in all environments. Thus, they were preserved as we interbred during our 50,000 years of migrating across the planet. As Linden puts it, "we are all mutts".

Complex traits vary widely within each group, and this is key to our species' success because it provides each group with internal capacity to specialize. Thus, each group can have some great hunters, great healers, navigators, artists, and so on. To benefit from the skills of its specialized members, the group needs to maintain a certain degree of harmony. That is why our brains invested strongly in complex circuits for art, music, dance, and storytelling — activities that, while providing no calories, are essential because they dissipate tensions and build within-group coherence.

Mixing between groups — what racists disparage as 'mongrelization' — belongs to our species' core. Recent genome-wide studies, as Linden explains, confirm repeated interbreeding and, partly because of this, find no evidence for between-group differences in the identified genes for intelligence or any other cognitive or behavioral trait.

Nevertheless, we still live with racial categories delineated according to geographically localized concentrations of small numbers of genes for skin color, hair texture, and physiognomy. The groups who defined these 'racial' categories have used them to dominate, always justifying the arrangement as 'natural'. But now 'the new science of human individuality' (from Linden's title) has kicked the last props from beneath the whole concept. As Linden explains so well, apart from a few simple traits optimized for particular local environments, we are all cut from essentially the same cloth.

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Q & A

Patricia Brennan

Patricia (Patty) Brennan studies genital evolution and sexual conflict in vertebrates. After completing her BSc in Marine Biology in her native Colombia, she worked onboard the R/V Odyssey*, a marine mammal research vessel in the Galápagos Islands. In 2005, Brennan received her PhD from Cornell University's Neurobiology and Behavior Department where she studied the mating behavior of great tinamous under the co-supervision of Stephen Emlen and Paul Sherman. During her postdoctoral work at Yale University with Richard Prum, and at the University of Sheffield with Tim Birkhead, Brennan was the first to discover variation in female genital morphology in waterfowl, launching her research program on the sexual arms race between male and female genital morphology. She is currently Assistant Professor of Biology at Mount Holyoke College, a women's college that is gender inclusive in Massachusetts, USA, where she studies genital co-evolution and sexual conflict in vertebrates, including sharks, birds, reptiles, and mammals.*

What turned you on to biology in the first place? I grew up in Bogotá, Colombia: a big city with lots of cars and not a lot of nature near my house. During our occasional family vacations to nearby towns, I discovered that my four sisters were easily terrorized by bugs, so I would collect beetles as well as frogs and chase them around. Being one of the youngest, it was great to have them run away from me for once. I had discovered the power of nature! When I was 13, I went snorkeling for the first time and became instantly captivated by the beauty of the coral reefs. I asked myself what I could do that would allow me to enjoy this beauty every day, and the answer was to become a marine biologist.

And what drew you to your specific field of research? I have always been drawn to study things that nobody has studied before, so for my PhD I studied tinamous, a group of very shy neotropical birds that had rarely been studied. One day I saw them mating in the forest, and it was unlike

any bird mating that I had ever seen! The male grabbed the female by her neck feathers while she was squatting and then she stood up with him still attached to her. When they separated, I realized that he had a weird corkscrew-shaped appendage protruding from his cloaca and figured it was a penis! I had never even heard that some birds have penises, and so I decided to look into this for my postdoc. I quickly found that we knew very little about genitalia in birds, and in vertebrates in general, especially about female morphology. I wrote a postdoctoral proposal to the National Science Foundation (NSF) to examine avian genitalia and never looked back. It has been amazing to make so many new discoveries in such evolutionarily important structures.

Who were your key early influences? I was influenced by a host of peer graduate students while I was at Cornell. Everyone was working to develop field-intensive systems independently, getting their own funding and designing all their research from scratch. It was a tough environment — sink or swim really — but I learned the importance of hard work, organization, and self-reliance to succeed in science. I was ready to run a completely independent research program by the time that I finished my PhD. I also benefited tremendously from an amazing cohort of women scientists working at La Selva Biological Station in Costa Rica when I was there working on my dissertation. They were tough, smart, and funny, and we supported each other through tough times as well as cheered for one another in good times. Building these support networks early in my career made me stronger and allowed me to take more risks than I may have otherwise.

Do you have a scientific hero? I recently met Cassandra Extavour, Professor of Biology at Harvard University, who was invited as a speaker to our college, and she blew my mind! Her research on the development of reproductive systems is fascinating and cutting edge, and she is also a full-time classical singer as well as an inspiring mentor. That anyone can do all these things well is amazing, but that this person can be a woman of color in the USA, with all the barriers that continue to exist for Black people to succeed, is literally awe-inspiring.

Do you have a favorite paper or science book? Recently, I really enjoyed reading *Lab Girl* by Hope Jahren. It takes a lot of courage to write openly about struggles with mental health while being in academia, but the book does much more than that: it is beautifully written, poetic, and engrossing.

What is the best advice that you've been given? Write every single day, ideally for half an hour but even for a few minutes. I try to do this first thing in the morning, before diving into e-mails and all other distractions. This practice has allowed me to continue to be productive because projects are always fresh in my mind, and I can work on drafts even when I only have 15 minutes to spare.

What has been your biggest mistake…? Being a Hispanic female and an immigrant, I ignored microaggressions during most of my academic career. I thought that I should just keep my head down and work twice as hard as everyone else, so that nobody could say that I did not belong. Now I know that I should have been speaking up, not to call anyone out but to invite them into a conversation that could make it easier for the next generations of BIPOC scientists, many of whom leave academia when they can't tolerate the toxic environment. Experience and more job stability have made me better able to speak up.

What is your favorite conference? The Animal Behavior Society conference was a favorite of mine for years. The society is very welcoming to researchers from all over the world but especially Latin America, and the research is fascinating and cutting edge. More recently, I started to attend and fall in love with the Society for Integrative and Comparative Biology (SICB) meeting. The integrative nature of the talks is always inspiring, and I have met really wonderful colleagues there too.

What is your greatest research ambition? To create the Vagina Research Institute! We would do integrative research on the evolution, morphology, physiology, and tissue mechanics of vaginas across vertebrates, and fill in all the gaps in our knowledge of this most amazing structure. We would examine how the vagina changes during sexual maturation, pregnancy, post-partum, and during aging from a comparative prospective. We are starting to ask some of these questions at a small scale and the answers are fascinating!

Do you feel under undue pressure to demonstrate potential relevance of your research for medicine or other 'applications'? Absolutely! My NSF research, initially funded when George

Bush Jr. was President, was attacked in the USA by extremist media during the budget sequestration in 2013 when Barack Obama was President. As part of regular efforts to highlight projects that are deemed 'wasteful', these media outlets attacked the relevance of my research into waterfowl genitalia, the Obama administration for funding it, as well as my personal character for studying genitalia. This attack quickly turned me into an activist and defender of basic science. I have published several articles on the importance of basic science and given many seminars on why scientists must take an active role in its defense. When this attack took place, I realized that I was unprepared to join the conversation because we do not formally teach this topic to our students or discuss it with our trainees. I believe that we all need to be ready with examples of the unpredictable connection between basic and applied science to highlight that, even when some basic science knowledge never becomes applied science, all applied science requires basic science, and therefore we must cast a wide net. As scientists, we ignore the constant dismissal of basic science at our peril. More and more funding programs are focusing on 'big data', artificial intelligence, and biomedical research, while natural history and fundamental research keep on shrinking.

If you had not made it as a scientist, what would you have become? I was a kickboxing and spinning instructor during most of my PhD, and I think that I would enjoy a career in fitness, dancing, or martial arts. Alternatively, I may have become a baker, so actually perhaps two of these careers would need to go together.

Which aspect of science, your field or in general, do you wish the general public knew more about? I wish people understood that science is self-correcting. People think that science should have all the answers and that, if some answers turn out to be wrong, then none of the answers can be trusted. This misunderstanding has often been exploited to manipulate people, as has become painfully obvious in the time of COVID-19. We make many mistakes in science, but this does not mean that science cannot be trusted. Science can be trusted precisely because it is designed to catch these mistakes and learn from them. I like to say that the sphere of knowledge has fuzzy edges, but the sphere itself always grows and it is solid at its core.

What do you think are the biggest problems science as a whole is facing today? We succeeded beyond our wildest dreams in recruiting more people — specially women — into STEM fields, so we have grown the number of scientists dramatically, and yet the funding to allow all these scientists to practice science never materialized. As a result, we lose many excellent scientists to a lack of job prospects after the PhD or postdoctoral training, and worse they leave science demoralized at what they perceive is a personal failure, when in reality it is the system that is failing. I think that we need to increase science funding dramatically to take advantage of the brain power that we have been growing for the past few decades.

Is there enough left to discover? I decided to pursue a PhD after we reported on the first live sightings of a new species of beaked whale in the Eastern Tropical Pacific that was previously only known by its skull. That we could 'discover' an eight-foot-long animal in 1998 was mind-blowing! Since then there have been four new species of whales added to the list. If we are still discovering whales, there is decidedly enough left to discover! But, herein lies the importance of diversity in scientists. People with different backgrounds, upbringings, and cultures will look at the same problem and ask different questions about it. Maybe some questions have been answered from one perspective, but only by making room for all the diversity will we get more complete answers to our many questions.

What's your favorite organism/cell/molecule? Caffeine! I am Colombian after all.

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Using GPS-enabled decoy turtle eggs to track illegal trade

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The insatiable human appetite for wildlife products drives species to extinction, spreads disease and has negative consequences for the economies of source countries [1,2]. As a major transnational enterprise, illegal wildlife trade is valued between eight and 26.5 billion US dollars annually [3,4]. Because law enforcement is often only reactive, information on trafficking routes is key to disrupting trade and curtailing wildlife crime. In our efforts to uncover trade routes of trafficked sea turtle eggs, we developed and field-tested the InvestEGGator, a 3D-printed decoy turtle egg embedded with a GPS–GSM transmitter (Supplemental Information). Illegally collected clutches of turtle eggs containing a decoy transmitter enabled us to track the movements of traffickers, and thus gain a better understanding of illegal trade routes. The decoys, set to emit a signal once an hour, provided five tracks, the most detailed of which identified an entire trade chain, covering 137 km. Using data provided by the decoys, we identified trafficking routes and on two occasions properties of potential interest to law enforcement. Decoys also yielded anecdotal information, furthering our understanding of trafficking routes.

We deployed one decoy per nest in 101 turtle nests on four beaches in Costa Rica, of which 25% were illegally taken (Supplemental Information). The decoys tracked eggs from five illegally removed clutches (two green turtle, *Chelonia mydas*, three olive ridley, *Lepidochelys olivacea*; Figure 1). Our shortest track emitted its final signal 28 m from a residential property, while another