

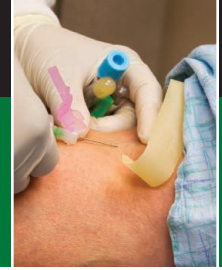
Intervening to observe

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To pay, or not,
for tissues?

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LETTERS

edited by Jennifer Sills

NextGenVOICES

Results: Experiences That Changed Us

In April, we asked young scientists to describe a specific experience and how it changed their science, training, or career goals.

We heard from more than 100 readers. A sample of the best responses can be found below. To allow for as many voices as possible, in some cases we have printed excerpts of longer submissions. To read the complete versions, as well as many more, go to <http://scim.ag/NextGen3Results>.

Submit Now: Big Ideas

Add your voice to *Science*! Our new NextGen VOICES survey is now open:

What one big idea in your field do you wish that every non-scientist understood? Why?

To submit, go to http://scim.ag/NextGen_4.

Deadline for submissions is 17 August. A selection of the best responses will be published in the 5 October issue of *Science*. Submissions should be 250 words or less. Anonymous submissions will not be considered. Please submit only once.

most to the development of neurons into various types? Why does the body set exact circuits in balancing diversified feedback loops? How do multiple mediators act in concert to produce an orchestrated “symphony” that enables the body’s responses to various challenges? Biology is amazingly beautiful!

WEN-QIANG CHEN

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... IN MY THIRD YEAR OF UNDERGRADUATE study, I went to Japan on an exchange program, and in order to get enough credits I joined the immunology laboratory for a research project. Everything in that lab—the techniques, the equipment, the experiments—was so new to me. The project I was given involved expression of some recombinant protein in *E. coli*. This particular protein is quite difficult to express, and after many weeks of trying I just could not approach my supervisor and tell him the experiment had failed AGAIN!!! I felt so overwhelmed that I went to the darkroom and started crying. A colleague of mine found me, and after I had explained the situation to her, she explained to me that every single scientist has had to go through many such moments. At that point, it hit me: For all the things I read in textbooks, someone at some point went through exactly what I was going through. I had never reconciled those two facts so solidly together. Until then, my sole purpose had to be to get good grades ... then and there in that darkroom, I decided to be a biomedical researcher when I returned to my country.



ANNE WANJIRU NDUNGU

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NextGen Speaks

AIR FRANCE FLIGHT 3210 PARIS-NOUMEA. I am taking off for my first field season and, like any neophyte Ph.D. student, I have brought with me an ambitious pile of articles,



in order to optimize my 24 hours on the plane. Although my thesis is focused on mathematical models of trophic relationships on islands, the scope of my literature selection is broader. “Stable isotopes reveal evidence of predation in seabirds on the Shiant Islands, Scotland” (Stapp 2002)—the title frightens me a bit; chemistry is an uncommon component in the methodological mixture of fieldwork that will start in 2 days! In the end, intrigued, I decide to add stable isotope sampling at the last minute. Little could I have anticipated how this article would enrich my future career. Ten years later, stable iso-

topes are part of my daily routine and compose the core of my research. What would I be doing, who would I be, if I had set that pile of articles aside and nestled down into my seat, like the other 250 passengers, to watch the in-flight movie?...

STEPHANE CAUT

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IN MY SCIENTIFIC CAREER, MOZART IS THE ONE who inspires me constantly. When I was a teenager, I was absorbed by Mozart, because his music is so pure and concise. When I began to study biology in my university, I felt the same purity and conciseness: Our body functions as

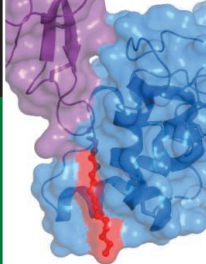


elegantly as Mozart’s music does! ... I am always wondering: What is the power determining cell fate? Which factor contributes



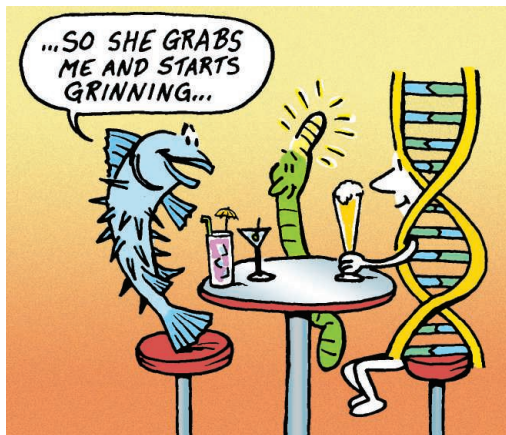
Pyruvate transporter identified

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Ligand-receptor interactions

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AS AN UNDERGRADUATE I APPLIED TO AN internship at Mote Marine Laboratory, hoping to work on a marine mammal project, but I was assigned to a dolphin prey species survey instead. Initially, I was bummed. I wouldn't get to work with dolphins, but would instead be fishing all summer. On my first day on the boat, I was regaled with all the very important safety procedures and got an extensive lesson on purse seining, where you use a large mesh net to sample the water column. We motored out to our first site and set the net. I was poised; ready to measure, ID, and count the fish as they came up. What I didn't realize

was how thrilling it would be. I distinctly remember grabbing my first pinfish. I was pricked and prodded by its spines as I tried to get the slippery, flapping fish to lay flat for a good measurement.



It was at that moment when I realized, "Aha! This is what I want to do!" I marveled at the diversity of sizes, shapes, colors, and even sounds of these animals. From that point on, I knew I wanted to study fish; how they work and interact with their environment. I made my decision that summer to pursue a master's degree in fish physiology, and now as I prepare to graduate, I am so thankful I had the opportunity to spend a summer fishing....

GENINE K. LIPKEY

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I STILL REMEMBER HOW BEAUTIFUL IT LOOKED on the crinkled pages of my ninth grade biology textbook. Behind the bursting red nucleus was forked DNA unraveled from its usual, beautiful helical shape. As an mRNA was produced, it threaded through the open pores of the nucleus and into a ribosome. Even after school ended, these artistic illustrations remained animated in my mind. I wondered what color the nucleus really was and



how these operations could occur so quickly, intricately, and flawlessly in our millions of cells to produce an organism so complex and diverse.... At this point, I knew that I wanted to pursue a biologically relevant field as a career....

LUVENA ONG

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ONE AFTERNOON WHEN I WAS 14 YEARS OLD, I saw a very peculiar fluorescent worm.... This event changed my entire life. Since that day, everything about nature was interesting to me, and I got involved in science. Now that I am in the biological sciences, I know that the bioluminescent worm I have never seen again is one of the forces that makes me fight to become a researcher.



RIGOBERTO MEDINA ANDRÉS

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DURING MY FORMATIVE YEARS, I TRAINED AS an associate at a medical research institute in-house at a leading hospital. Generally, when patient tissue samples were accessed from the hospital facilities, it was always anonymous and alphanumerically coded. On one occasion, the family of a deceased patient with a unique medical case history refused to grant access to the mortal tissue remains for research use. A personal assurance from the director finally helped convince the nearest kin.



As a follow-up, they were requested to attend one of our research meetings where we discuss results from those very samples. The wife and the teenage son sat in one corner of the seminar room, gazing nervously at the scientific populace. They looked through all the histopathological and immunofluorescence images, perhaps understanding nothing, but trying to find which slide they perhaps had a bloodline tied to. As I escorted them to the lift lobby after the meeting, the lady held my hand in reassurance and gratitude, with glistening eyes pouring over with faith.... Since then, I have seen thousands of cell and tissue slides. And every single time I think of her gaze and her unspoken words when I finally place the cover slip over the

MY CAREER WAS DEFINED BY A SHORT ARTICLE written for high school biology teachers in the late 1970s. I was a sophomore in high school in San Juan, Puerto Rico, at that time. Biology was that one class that felt true to me in that awkward and social-pressured time called high school, and I quickly became very interested in the class and in nature itself. During off times, like at lunch or immediately after the last bell, I would wander into the biology lab and spend time with the biology teacher and other like-minded students. There was always something cool to watch, like the fish tank with the sea horse that one of my classmates brought in or the assembly of a cat skeleton in progress. One afternoon, I picked up a short periodical among my teacher's pile of papers and read an article describing the cloning of the insulin gene by scientists at Genentech in California. The article described how researchers cloned and produced large amounts of recombinant insulin in *E. coli* without this being a detriment to the cells. The bacteria had become a mini protein factory that could in theory eliminate the need for pig stomachs as a source of insulin for diabetics. After reading the article, I thought to myself "This is what I want to do." There was no question. I have yet to waver from this path....



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TECHNICAL COMMENT ABSTRACTS

Comment on “Impacts of the Cretaceous Terrestrial Revolution and KPg Extinction on Mammal Diversification”

Olaf R. P. Bininda-Emonds and Andy Purvis

Meredith *et al.* (Reports, 28 October 2011, p. 521) question three findings of our delayed-rise hypothesis for present-day mammals made with reference to the Cretaceous-Paleogene (KPg) boundary, based on their new time tree of the group. We show that their own data do not support their objections and that the macroevolutionary patterns from the respective phylogenies are not statistically different.

Full text at www.sciencemag.org/cgi/content/full/337/6090/34-a

Response to Comment on “Impacts of the Cretaceous Terrestrial Revolution and KPg Extinction on Mammal Diversification”

William J. Murphy, Jan E. Janecka, Tanja Stadler, Eduardo Eizirik, Oliver A. Ryder, John Gatesy, Robert W. Meredith, Mark S. Springer

Bininda-Emonds and Purvis reanalyzed our mammalian phylogenetic supermatrix and claim that our results are not significantly different from their delayed-rise hypothesis. We show that our divergence times are ~11 million years later for placental inter- and intraordinal divergences—consistent with a post-Cretaceous-Paleogene (KPg) radiation of most modern mammalian orders—and find no support for the early Eocene delayed-rise hypothesis.

Full text at www.sciencemag.org/cgi/content/full/337/6090/34-b

sections. I wouldn't say the feeling makes my images look amazingly good, but it gives me that extra willpower and hope to regard my efforts as precious.

KINGSHUK PODDAR

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... IF I HAVE TO NAME ONE EXPERIENCE THAT changed my career goals, it was a visit to a rural high school outside of Winston-Salem, NC. I was there for NHGRI's National DNA Day. The teacher told us that he had to teach evolution at the end of the semester because

parents were bound to pull students

out of class. If he taught it earlier, he would lose the student for the entire semester. I was shocked and saddened to hear this.

As long as people who live so close to where I practice science feel this way, I won't be content to

only pursue research—science outreach will always be some part of my career.

VIRGINIA K. HENCH

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I WAS LEADING A BIOLOGY 101 EVENING LAB, and one of my older students was having a little trouble with the microscope. I helped her find the elodea leaf and then put the specimen in focus. When she looked again, she yelled out, “I see it, I see it, I see it!” and did a little



dance. She was so excited and thanked me over and over again for my help.

That moment will always stick with me; at that time

I wasn't completely sure I would make it as a great teacher.

I think I am a good teacher, but I know I can be better. That one moment helped focus me to work harder to have more moments like that! I want people to see the science all around them and to help them understand it better!

CHRIS WAYNE HOLMAN

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I WAS BORN AND RAISED IN A VILLAGE IN NEPAL. During my high school time, only talented students were encouraged to major in science. Most of the community members believed that studying science leads to a better job and good life in the future. This is true. That community perception actually brought me to science.... Now I am happy with a career in chemistry....

BASANT GIRI

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JUST OUT OF COLLEGE WITH A JAPANESE LITERATURE degree, I toured a state-of-the-art recycling plant in Yokosuka, Japan. When I heard the figures on the staggering amount of waste the facility processes (about 220



tons per day, or around 50,000 tons per year for a city of 400,000 people, or around 125 kg per year per person), I was amazed; it seemed like a lot of trash

for a small city. This was what started my investigation of the fate of household waste. Then I got into looking at where the things we use come from, which eventually made me realize it was time for a career change. It turns out you need to know things like physics, chemistry, and biology to understand energy and material cycling, so I went back to school. I ended up studying agriculture and environmental chemistry, and that's what I'm up to today.

MIKE MASSEY

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WHEN I WAS 18 YEARS OLD, I WORKED IN A hospice for 12 months as part of my civilian service requirement of the German government. I accompanied old and young people in what was the last chapter of their lives....



Throughout my time in this hospice, I learned many life lessons from older individuals about the importance of changing priorities when you get older, “letting things go,” and the value of time

over money. Some of the merits of these lessons I only now begin to realize. These and other experiences inspired me to study the psychology and neuroscience of aging, because I realized that the aging mind and body has a fascinating recovery potential and experience that is often so underutilized. Sometimes I am still stunned by the variety and diversity of the aging population, and although I see less of them in my daily routine, I am grateful for the opportunity to study the aging mind.

GÉRARD NISAL BISCHOF

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Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the past 3 months or matters of general interest. Letters are not acknowledged upon receipt. Whether published in full or in part, Letters are subject to editing for clarity and space. Letters submitted, published, or posted elsewhere, in print or online, will be disqualified. To submit a Letter, go to www.submit2science.org.