

Commentary

Researching around Europe: A personal reflection

Seven years ago in Spain, I was waiting in one of Barcelona's central train stations, ready to jump on the same train I had been taking for the past four years of my undergraduate career. My life at the time was pretty vibrant: I'd wake up, go to track-and-field training, attend university lectures, give private science lessons, and then go back to training again.

Those commutes were my only spare time, so it is not surprising that it was during one of those daily rides that I had an epiphany: "I don't want to take this train every single day anymore," I thought to myself.

I was nearly at the end of my studies, and I knew I needed a change. But what I didn't know was that my realization would take me on an adventure around Europe. That seven-year-long journey would lead me to become not only a more complete person but also a better scientist.

As an undergraduate at the Autonomous University of Barcelona, I studied nanotechnology. Combining physics, chemistry, and biology, the major was the perfect fit for my young and curious mind that wasn't sure which scientific field it wanted to marry yet. I loved my lectures, which provided me with answers for many of my everyday questions. As a keen runner, I better understood what I should eat before competitions. As a not-so-keen cook, I also understood why my granddad was slowly adding oil to smashed garlic to stabilize aioli, a delicious Mediterranean version of mayonnaise.

Unlike the lectures, the research training was not so enjoyable. My classmates and I did not have many opportunities for real hands-on research experiences. With a spirit of trying to figure out whether academic research was the right career path for me, I decided to change gears and experience new forms of education. And as much as it was a scary thought at the time, I was also ready to leave my home country of Spain.

I applied and was accepted to a two-year master's program in nanomaterials at Utrecht University in the Netherlands.



CARLA FERNANDEZ RICO has conducted research in Spain, the Netherlands, the UK, and Switzerland. She is seen here examining a sample of fluorescent colloidal particles in her current lab at ETH Zürich.

The program seemed very appealing to me as it was heavily based in practical research and taught in English, the vehicular language of science. Attending Utrecht was the first time I had really stepped out of my comfort zone. I took a deep dive into a different society and gained an incredible new level of maturity. Academically, I finally experienced the direct application of theoretical concepts, as the taught courses were tightly related to the research done on campus.

My experience in Utrecht transformed my view of both science and life. Research-wise, such a positive experience wouldn't have been possible without the help of my excellent master's project supervisor, Samia Ouhajji. When I felt lost during my project because experiments wouldn't work, she gave me a great piece of advice: Sometimes you have to accept

that you can't control everything and must let things go. She patiently guided me on the unknowns of scientific research and didn't judge my English, which was sloppy at the time. I now understand how pivotal it is for young researchers to have good mentors at the early stages of their development, as it shapes their future approach to science.

To complete my master's degree, Utrecht required me to do a five-month internship at a different university or at a company. It was the perfect opportunity to explore the world a little further and learn about new scientific cultures. After a few Skype calls with Roel Dullens, then a professor at the University of Oxford, I joined his group as an intern. Half a year later, I would return to Oxford as a PhD student, with Roel as my adviser.

Truth be told, deciding to stay in the

UK for my PhD wasn't an easy choice, especially because I was starting to feel a little homesick. Nonetheless, I had established a great relationship with my future supervisor, which I knew would be a critical factor in enjoying my PhD journey. Also, during my internship, I'd learned that I liked the city and my group. So I decided to stay.

The next four years in Oxford were full of ups and downs, as any PhD journey promises to be. In a way, I had arrived almost by chance to one of the top universities in the world, and it took me about six months to leave behind my insecurities about not being good enough. But once I got my balance back—learning to carefully juggle work, sports, and home—I managed to have a great and productive PhD experience, in a rather special place, as Oxford is.

After I successfully obtained my doctorate in physical chemistry, I was again left deciding what to do next. Having decided to stay in science, I felt ready to dive into something more interdisciplinary than my thesis topic while still honoring my nanotechnology roots. I contacted Eric Dufresne, the principal investigator of an amazing materials group at ETH Zürich, and ended up joining his group as a postdoctoral fellow. With this opportunity, I wasn't held back as much by the lingering feeling that it was time to go home. I guess over the years I have had time to refine what I call my "personal recipe for balance," and I'm now better able to pursue my curiosity and explore new social and scientific cultures without it costing me too much energy.

Looking back, I've realized one of the best things about moving to different countries to do research is that it forces you to take on different lenses through which to view science. In my case, I don't

think I could have developed as much of an interest in its fundamental aspects if I had stayed in Barcelona. In Spain, more scientific funding goes to applied research, which intends to provide immediate solutions to problems. And as much as that type of science is necessary, diving into fundamental problems is intrinsically the other side of the coin, and both are equally needed for sociotechnological progress. In my experience abroad, I have found that funding bodies in the Netherlands, the UK, and Switzerland have been more ready to support both fundamental and applied science.

Rather than saying which places are better for doing research, I will say that moving to different countries has allowed me to become a more complete scientist—one who asks both "What is this useful for?" as I learned to do in Spain, and "How does this work?," as I practiced in the UK and the Netherlands. In the same way a microscope characterizes different features depending on the lens being used, I feel that I am now able to appreciate subtleties in my research and come up with problem-solving approaches in ways I simply wasn't able to before.

Sometime in the future, I hope to go back to Barcelona and bring with me all the knowledge I've gathered from around Europe. But for the time being, my adventurous spirit still tells me to make the most of my time in Zürich—and maybe even explore a bit further. Let's see what the next stop is!

Carla Fernandez Rico

(carla.fernandezrico@mat.ethz.ch)

ETH Zürich

Zürich, Switzerland

LETTERS

Space-colonization complications

Charles Day's column "Space barons" (PHYSICS TODAY, September 2021, page 8) discusses how the Sun will eventually reach its red-giant stage and "humanity will need a new, distant haven that only spacecraft can reach." Day writes that "in so far as commercial space travel will make that possible, we should commend it however grudgingly." Also, in the book *The High Frontier: Human Colonies in*

Space (1977) and in a September 1974 article in PHYSICS TODAY (page 32), Gerard O'Neill of Princeton University explores the idea of space colonization. More immediate threats, however, might well cause us to become extinct long before the Sun's red-giant stage.

Thorny questions arise: Which species might be chosen to survive? Would fiat, a random drawing, or voting decide the selection of future "leavers" and "stayers"? Should the prospect of escape from Earth be skewed in favor of the descendants of funders (a pay-to-play system)? Might our descendants muck up a future nest just as quickly as we have fouled our current one? Might we decide that humanity has been a failed experiment not to be protected from oblivion?

Perceived existential threats and our responses could change over eons, adding an element of uncertainty to decisions we might make today about distant havens. Moreover, we don't know how humans will evolve in the future.

The column asks, "Equity of access aside, is it a bad thing when rich people fund science?" Certainly, setting aside equity of access raises questions of morality, fairness, and justice. And rich people funding science can mean that the astonishingly wealthy are dictating priorities that impact the survival of the wider population. Such priorities might naturally trend toward sending a favored few to "sexy" distant havens that lurk in the dim future, with slim odds of success and at the expense of egalitarianism and more immediate needs of the populace.

On reflection, there are many alternatives to grudging commendation. Planet Earth has already demonstrated itself to have been a sustainable home for plants, and that could perhaps be replicated on a distant haven.

Evan Jones

(revwin@yahoo.com)

Sacramento, California

Corrections

April 2022, page 25—The figure caption should state that the Vera C. Rubin Observatory is scheduled to see first light in 2023.

April 2022, page 48—Ronald Bracewell, not Roland Bracewell, proposed using a twirling space-based interferometric array to detect exoplanets. **PT**

CONTACT PHYSICS TODAY

Letters and commentary are encouraged and should be sent by email to ptletters@aip.org (using your surname as the Subject line), or by standard mail to Letters, PHYSICS TODAY, American

Center for Physics, One Physics

Ellipse, College Park, MD 20740-3842. Please include your name, work affiliation, mailing address, email address, and daytime phone number on your letter and attachments. You can also contact us online at <https://contact.physicstoday.org>. We reserve the right to edit submissions.