CAREER COLUMN · 23 APRIL 2021

How philosophy is making me a better scientist

Rasha Shraim's education helped her to think more deeply about ethics, logic and other big questions.

Rasha Shraim

Credit: Gabriel Bouys/AFP/Getty

I am the only student on my PhD programme in genomics data science with an undergraduate degree in biology and philosophy. Initially, I saw these as separate fields: I was writing about theories of morality in one class and memorizing the Krebs cycle in another. It was only after picking up first-hand research experience while working on my final-year biology thesis at New York University Abu Dhabi that I began to understand how philosophy can make me a better scientist. As I progress through the early stages of my PhD, I can see how impactful reading and studying philosophy have been in shaping my career so far, and how much they will continue to influence me in my future work.

Philosophy has expanded my critical and creative thinking. Philosophical arguments often

lead to imaginative edge cases and a dive into hypotheticals, which I frequently find creatively stimulating. For my philosophy thesis, for example, I wrote about the metaphysics of identity, the Ship of Theseus (a thought experiment that questions whether an object that has had all of its components replaced remains fundamentally the same object), general relativity and some of the philosophical implications of time travel.

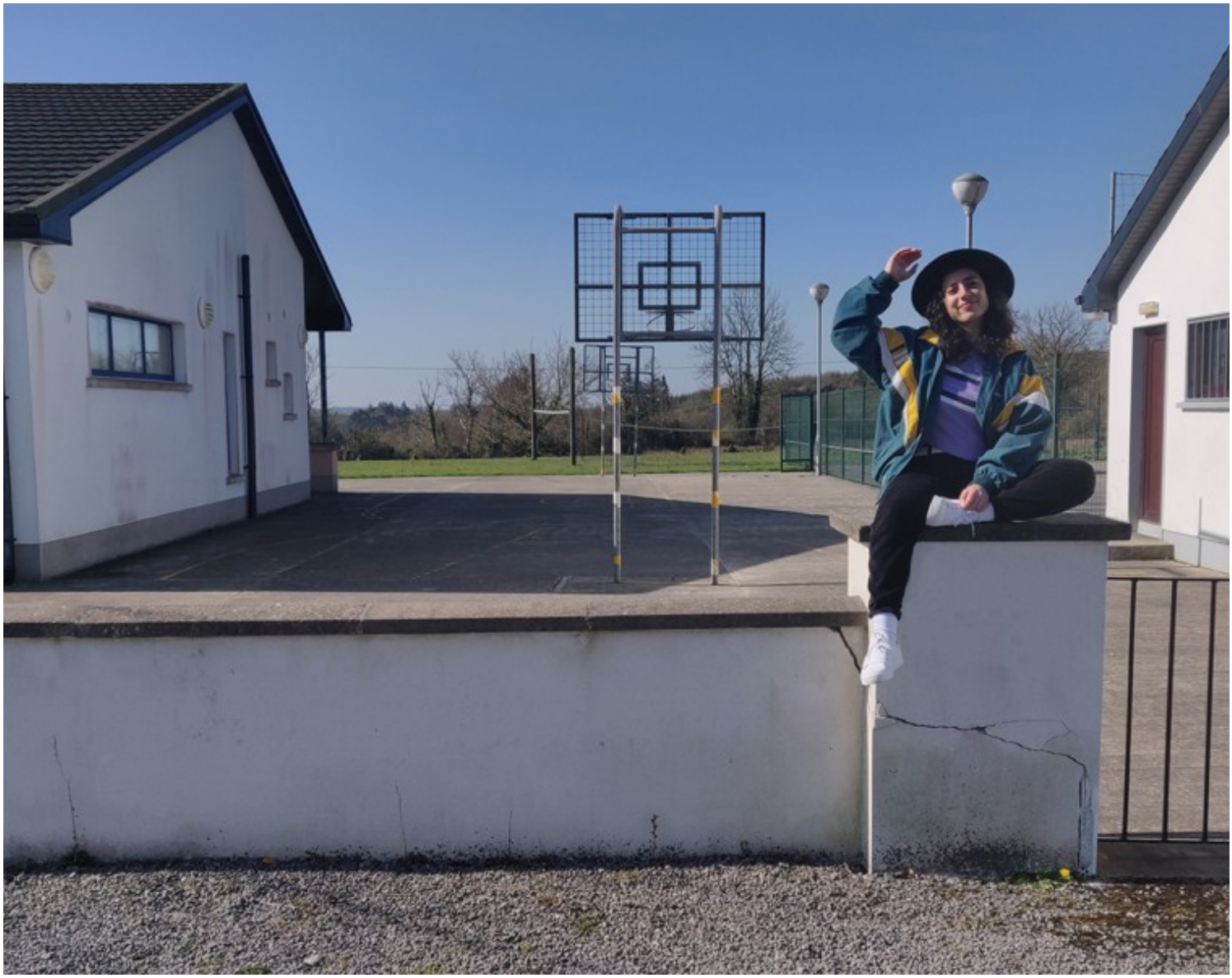
Thinking creatively while maintaining a critical and methodical approach carried over into my research. For example, studying instrumentalism — the philosophical idea that science does not uncover fundamental truths about the world, but merely provides us with tools to help us navigate it — helped me to adopt a more fluid approach to research and look for useful tools wherever I could find them. One thing I've done is to repurpose 'contamination' in an organism's sequencing data so that I could look for viruses in its blood.

RELATED

Keeping two journals has made me a better scientist

I also learnt logic. Most of us have a foundational understanding in this area — but, as a philosophy student, I was required to take a structured course in logic. At the start, it was like taking a class in brain-teaser puzzles: $A \wedge B$ is true if both A and B are true; $A \vee B$ is true if either A or B is true.

But my study of formal logic turned out to be very helpful in my transition from a wet-lab undergraduate scientist to a computational scientist on my master's programme as I learnt coding languages, which involve elements such as logical operators and if-then reasoning. It also helped me to understand inference, the process of arriving at conclusions from evidence and reasoning. None of my science classes has formally taught the difference between induction (these frogs are all from this pond and they are all green: therefore all of the frogs in the pond are green) and deduction (all frogs in this pond are green and this frog is from this pond: therefore this frog is green), nor have any of them taught how to methodically evaluate arguments. Reading, studying and evaluating philosophical arguments as premises and conclusions has shaped my ability to scrutinize evidence and conclusions in research reports.



Philosophical arguments have often led Rasha Shraim to explore creatively stimulating edge cases, she says. Credit: Devin Quinn

Beyond methods and data, philosophy pushed me to inwardly and outwardly examine the values and ethics behind science. Researchers are human, and our subjectivity and values inevitably influence our work. We might discuss glaring historical examples of unethical experiments or rogue scientists, such as He Jiankui and the gene-edited babies. But we rarely teach and discuss how everyday choices of everyday scientists can have serious ethical impacts: choices of colours on published figures; genotyping only populations of European descent; researching vulnerable groups without offering protection or help; or even the questions that we choose to pursue. Studying philosophy taught me to take both grand and smaller choices seriously.

RELATED

Collection: the PhD

Through philosophy, big questions grew familiar and it became easier to ask them in everyday life. During my PhD programme, I took a class on Mendelian randomization (a genetics research method that aims to identify modifiable risk factors for diseases), and we discussed how socioeconomic factors need to be accounted for statistically. I wanted to push this discussion past methodology, so I asked: if socioeconomic factors are significant predictors of health outcomes, why not divert medical research funding directly to food programmes, or schools, or income support, to fix medical problems before they occur?

In thinking through such challenges, I form a clearer idea of my motivation and goals in genetic health research, and of which opportunities I should pursue. Rather than being driven only by scientific curiosity, I've found my motivation stemming from a desire to influence the world in a positive way.

If it can help us to think critically about science and our goals, and to recognize that scientific progress is rooted in creative philosophical enquiry, and if it can prompt us to ask important questions, then I think we could all benefit from reading more philosophy.

Philosophy resources for scientists

Logic and inference. Duke University in Durham, North Carolina, offers an introductory online course in logic and critical thinking that covers the basics of argumentation, including induction and deduction. These concepts are useful in evaluating other people's reasoning, and in building your own sound arguments. For more in-depth material on formal logic and its semantics, try this free textbook: *An Introduction to Formal Logic*, by P. D. Magnus (Fecundity, 2012); or *Introduction to Logic*, a free online course designed to accompany a book of the same name by Paul Herrick (Oxford Univ. Press, 2012).

Philosophy of science. *Theory and Reality: An Introduction to the Philosophy of Science*, by Peter Godfrey-Smith (Univ. Chicago Press, 2003), provides an introduction to the subject aimed at general readers. It covers key thinkers in the area, including Thomas Kuhn, who

wrote *The Structure of Scientific Revolutions*, and Karl Popper, who wrote *The Logic of Scientific Discovery*. Other titles in the field include *The Fate of Knowledge* by Helen Longino (Princeton Univ. Press, 2001), and *Exceeding Our Grasp: Science, History, and the Problem of Unconceived Alternatives* by Kyle Stanford (Oxford Univ. Press, 2006).

Ethics. For a general introduction to the field of ethics, read Plato's *The Republic* or Aristotle's *Ethics*, or try *The Metaphysics of Morals* by Immanuel Kant or *Utilitarianism* by John Stuart Mill. These provide a historical perspective and broad frameworks of ethics and morality. *Applied Ethics* by Peter Singer (Oxford Univ. Press, 1986) aims to ground theory in a wide range of practical situations. Although it starts out intuitively, ethics quickly becomes complex; the best option is to seek out specialized material (for example, I am taking a workshop on ethical considerations in biomedical 'big data').

General notes. *The Stanford Encyclopedia of Philosophy* is a great and reliable online resource for exploring philosophical terms and concepts, and has entries on the philosophy of particular scientific subfields, such as the philosophy of cell biology. My background, and therefore my suggestions, are mainly rooted in the Western tradition, but I aim to continue diversifying my education.

doi: https://doi.org/10.1038/d41586-021-01103-x

This is an article from the Nature Careers Community, a place for Nature readers to share their professional experiences and advice. Guest posts are encouraged.