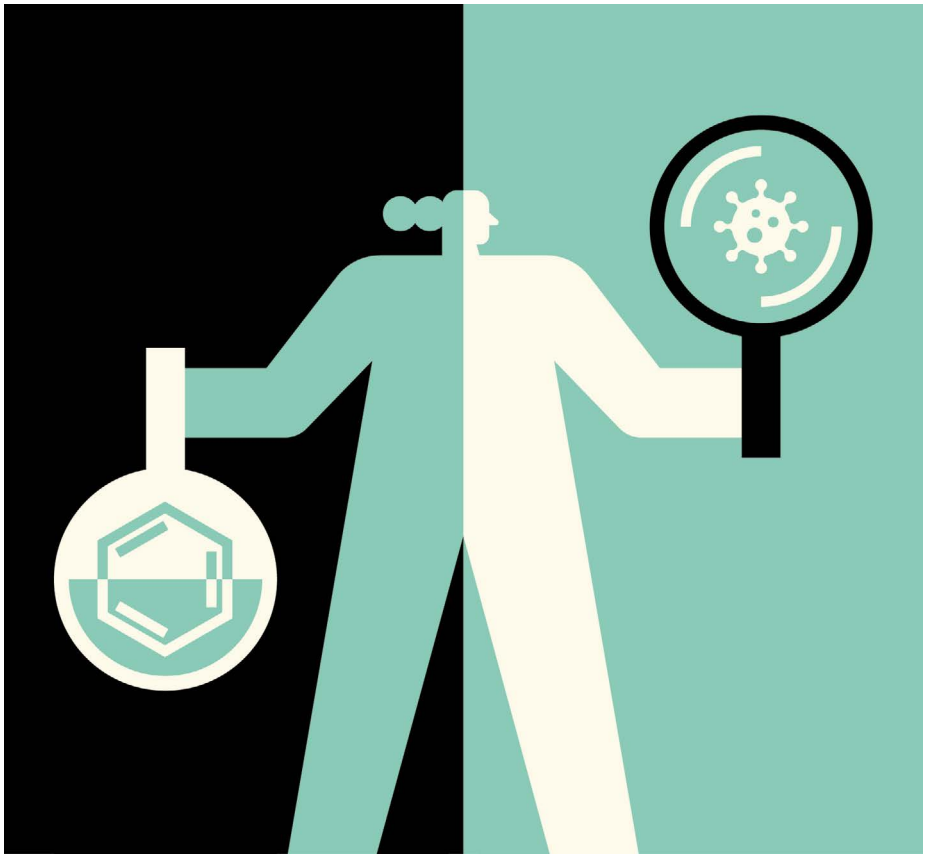


CORONAVIRUS HAS SHIFTED WHAT SCIENTISTS STUDY — AND SOME WON'T GO BACK

Thousands of researchers have jumped into studying coronavirus and many want to continue.

Roser Valentí typically spends her days using quantum physics to understand exotic states of matter. But last month she turned her modelling skills to a very different problem — simulating the evolution of the coronavirus pandemic. "Our normal daily things lost their importance," says the theoretical physicist at the Goethe University Frankfurt, in Germany. "We thought: can we do something to contribute to understanding what's going on?"

Even when the pandemic subsides, Valentí wants to maintain her double identity, pursuing both her old and her new interests. And she's not the only one anticipating a permanent shift in focus. Around the world, thousands of scientists have quickly pivoted to researching COVID-19, or using their equipment to run diagnostic tests. If enough researchers embrace this change, it could prompt a vast shift in the scientific landscape.

"People will be interested in this at a basic scientific level for years to come," says Trevor Forsyth, a biophysicist who leads the life-sciences group at the Institut Laue-Langevin (ILL) in Grenoble, France. His team normally uses the facility's neutron beams to study the structure of misfolded proteins and other complex molecules. But this year, for the first time, the group started focusing on viruses. His students are eager to work on coronavirus-related projects — some just want to get back to the laboratory, whatever the work involves — and the list of research questions is long, says Forsyth. "I don't for a minute think those things will disappear when the crisis passes."

> **"I don't for a minute think those things will disappear when the crisis passes."**

Experts say that research into infectious diseases is likely to enjoy a higher profile as a result of the pandemic, but that will depend heavily on whether governments alter their funding patterns in the long term. "It's definitely true that we have seen major shifts in the direction in which science is funded in the past, and that may be what's going to happen here," says Paula Stephan, an economist of science at Georgia State University in Atlanta. "But I think it's a little too early to know."

Science after shocks

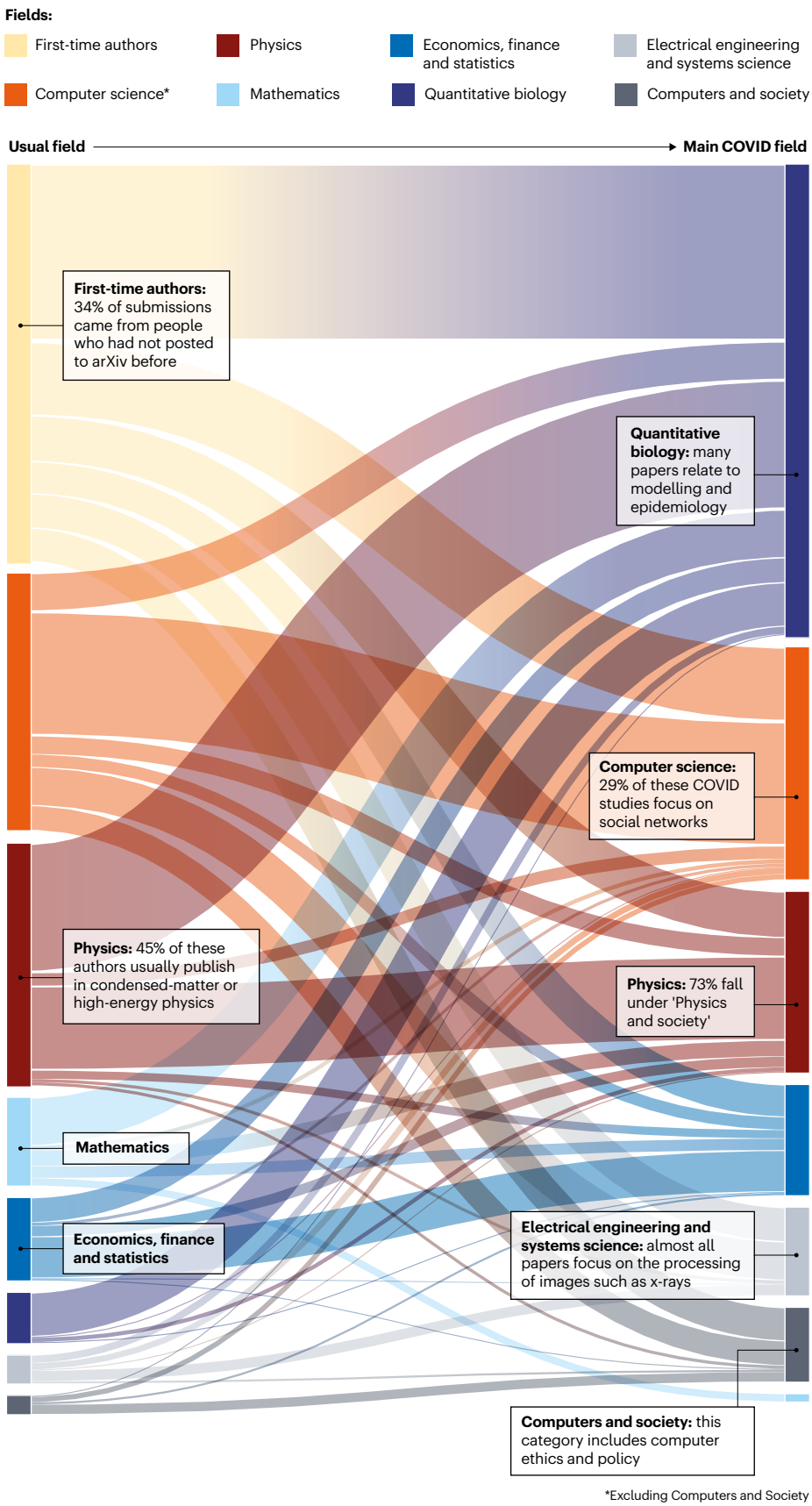
Major global events often leave dramatic imprints on research. Nations invested heavily in physics and engineering during the Second World War, and those fields kept their momentum in peacetime; the post-war boom in high-energy physics helped to reveal a raft of new particles, says David Kaiser, a physicist and historian of science at the Massachusetts Institute of Technology in Cambridge. And the 1918 influenza pandemic is likely to have stimulated the emergence of virology, says David Jones, a historian of medicine at Harvard University, also in Cambridge.

The new coronavirus, SARS-CoV-2, has already made its mark on research. Data from preprint servers such as bioRxiv, medRxiv and arXiv indicate more activity than usual in certain fields, which could be due in part to some scientists redirecting their efforts to study the coronavirus. The overall share of papers in bioRxiv's microbiology category, which includes the biology of viruses, is higher than in 2019, whereas the share for neuroscience has shrunk. In the physical sciences, the field of 'populations and evolution', which includes modelling and epidemiology, received proportionately almost five times as many submissions in March, April and May as in the same period last year, albeit from a small baseline, says Paul Ginsparg, a physicist at Cornell University in Ithaca, New York, who co-founded arXiv. More than 100 authors who usually publish in high-energy physics and condensed-matter physics had submitted coronavirus-related work, so the rise in such submissions isn't just the result of infectious-disease researchers in overdrive (see 'Switching subjects').

The crisis could have a strong influence on students, especially those just starting out. Several major research universities contacted by *Nature* noted, anecdotally, that interest in postgraduate programmes in fields such as infectious-disease modelling was unusually high. But the institutions cautioned that the lead time of applications meant it was too early to say whether the pandemic was influencing student choices.

SWITCHING SUBJECTS

More than 1,000 COVID-related papers have been submitted to the arXiv preprint server. One-third are from authors who had never posted to arXiv before, and another third submitted in fields outside their usual physical-science subject. Both groups are represented by streams that change colour.



Thomas Carell, a chemist at the Ludwig Maximilian University of Munich in Germany, thinks the coronavirus crisis will tip the scales in favour of infectious-disease studies — elevating them to the prominence of energy and battery research in chemistry. His group usually studies the fundamental chemical biology of DNA and RNA, but in recent weeks the researchers have expressed small portions of the viral genome in cells in which they and collaborators are testing ways to disable the viral material. Students in his lab — even those two or three years into their PhDs — have been switching to coronavirus-related work or adapting existing projects, says Carell.

But for many scientists, interest in COVID-19 could prove temporary. Some of the research boom comes from researchers wanting to contribute at a moment of societal upheaval, notes Ginsparg. Others have switched because studying the virus is the only way they can reopen their labs, says Jones.

Long haul

Funding will be the main factor that steers where research goes in the future. Even the billions of dollars already dedicated to coronavirus research are not enough to change the course of science, says Stephan. Any major shift will require sustained cash, she says — something that might not be forthcoming if a vaccine exists a year from now, or if research budgets plummet. "The response will depend on how quickly things get back to having some sense of normalcy," Stephan says.

But if the virus remains and continues to suck up government money, that could create a "black hole" that pulls in researchers who have focused on other diseases, or who work outside the life sciences altogether, says Jones. Blue-skies research could lose out, in particular, which would squeeze the pipeline of science for decades, says Stephan. Even before the pandemic, funding agencies were veering away from risky and abstract research, she says. "This may push the balance even further."

Joseph Buckley, a mathematical modeller at University College London, is eager to get back to his basic research. He has temporarily replaced theoretical research with practical simulations of how the virus gets into human cells, but "I just like theoretical things more than practically generating results," he says.

Other scientists, such as Valentí, can't see themselves abandoning studies related to the pandemic, even if they do resume their normal research. "Now I've started, I find it extremely interesting and challenging," she says. "It feels very different describing people rather than tiny particles."

Elizabeth Gibney is a senior reporter with *Nature* in London.

SOURCE: ARXIV PAPERS SUBMITTED UNTIL 25 MAY 2020. 'COVID-RELATED' REFERS TO PAPERS WITH 'COVID' OR 'SARS-COV-2' IN ABSTRACT OR TITLE