ficient. The gold standard is to also provide evidence of another key attribute of superconductors: their ability to expel an applied magnetic field when they cross Tc and become superconducting. Measuring that effect in a diamond anvil cell is impractical, so experimentalists working with hydrides often measure a related quantity called "magnetic susceptibility." Even then they must contend with tiny wires and samples, immense pressures, and a background magnetic signal from metallic gaskets and other experimental components. "It's like you're trying to see a star when the Sun is out," Hamlin says.

The study's magnetic susceptibility data were what led to the retraction. The team members reported that a susceptibility signal emerged after they had subtracted a background signal, but they did not include raw data. The omission frustrated critics, who also complained that the team relied on a "user-defined" background—an assumed background rather than a measured one. But Salamat says relying on a user-defined background is customary in high-pressure physics because the background is so hard to measure experimentally.

"There have been a lot of questions about this result for a while."
James Hamlin, University of Florida

In response to some of the criticisms, Dias and Salamat in 2021 posted a paper to the arXiv physics preprint server. It contained raw susceptibility data and purported to explain how the background was subtracted. "It raised more questions than it answered," says Brad Ramshaw, a quantum materials physicist at Cornell University. "The process of going from the raw data to the published data was incredibly opaque."

Hirsch, a firebrand who has criticized other hydride superconductivity claims, has made stronger accusations. He says some of the published data presented by Dias and Salamat could be represented by a smooth polynomial curve—impossible for noisy laboratory measurements. "I think they were fabricated," Hirsch says. He also noted suspicious similarities to data in a 2009 *Physical Review Letters* paper on superconductivity in europium under high pressures. That study, which shared one author with the *Nature* paper, was retracted last year because of inaccurate magnetic susceptibility data.

In preprints, Hirsch kept hammering on the Dias study—so forcefully that in February, arXiv temporarily banned him from posting. He also complained to the University of Rochester, which in two inquiries found no evidence of scientific misconduct. This month, Hirsch and another critic, Dirk van der Marel, a condensed matter physicist at the University of Geneva, published their conclusion in a physics journal that the susceptibility data in the Dias study are "pathological." Van der Marel is heartened by the *Nature* retraction. "It is good to know you are not alone in believing something is seriously wrong," he says.

Dias says the team plans to resubmit the paper to *Nature* without any background subtraction; he says the raw data alone show the change in magnetic susceptibility. Salamat also notes that Hirsch and Van der Marel are not high-pressure experimentalists. "We believe that some of their actions have veered into personal attacks," he says. "We're just not going to have people throw mud at us from a distance." Dias sent "cease and desist" letters to Van der Marel and to Hirsch's department chair and dean at UCSD.

Eremets says the Dias study might still be right about CSH. But he has tried at least six times to replicate the results and failed. Although Dias's team has shared the basics of its experimental protocol, Eremets says they have been less forthcoming in the details, such as what type of carbon they used in their CSH mix. Boeri agrees. "There are a lot of people who are a lot more careful, and they share the data, and they share the samples," she says.

Salamat says colleagues are welcome to come to their labs and observe their methods and protocols. "We have an open-door policy." And he points to a CSH replication published in July. Critics question its independence, however, because it was led by Salamat's group and includes many of the same authors as the *Nature* paper.

Dias and Salamat are not slowing down. The duo has co-founded a company, Unearthly Materials, to pursue commercial room-temperature superconductors. At conferences this summer, Dias has presented claims of superconductivity in new hydride compounds. Although he declined to comment on those claims until they are published, he says, "We've moved on from the 2020 work." Salamat adds, "We're on the precipice of a new era of high-temperature superconductivity."

Eremets is skeptical that Dias's new superconductors will stand up to scrutiny. "How is this possible? Everything he touches turns to gold." But he is confident that the patient work of science, underpinned by painstaking replication, will sort the real promise of hydrides from the questionable claims. "Science is not afraid of these things," he says. "The truth, sooner or later, will come." ■

WORKFORCE

University pandemic policies raise equity worries

Tenure delays and pandemic impact statements could backfire, some fear

By **Katie Langin**

As the COVID-19 pandemic swept across the globe in 2020, calls began to ring out for universities to swiftly address concerns that interruptions to research, closure of schools and day cares, and other disruptions could widen existing inequities in academia and make it harder for women and researchers from other underrepresented groups to stay afloat. Many universities in the United States and elsewhere went on to institute new policies to support early-career faculty, including delaying tenure decisions and giving applicants for tenure and promotion a chance to disclose how COVID-19 disruptions had impeded their work. But despite the good intentions, many worry these moves fall short of what is needed—and if not properly implemented, they could end up infusing more bias into tenure and promotion decisions.

"These are complex problems in which a single pandemic impact statement or a tenure delay is not really going to address everything," says Dawn Culpepper, associate director of the ADVANCE Program for Inclusive Excellence at the University of Maryland, College Park. "We need more creative thinking on these issues."

Culpepper recently completed an analysis of policies for pandemic impact statements at 65 research-intensive universities in the United States and Canada. More than half didn't have publicly available campus-wide directives. Of the 27 that did, policies varied widely. At some universities, faculty were encouraged to write only single-paragraph statements; at others they were allowed to submit up to five pages. One university required all faculty going up for tenure or promotion to submit a statement; the others simply offered the option. Only 59% of institutions pro-

vided guidelines for reviewers about how to interpret the statements, and most of those that did only gave vague instructions. "I'm worried … that reviewers are making judgment calls about what kind of COVID impact statements are valid and legitimate and which ones aren't," says Culpepper, whose analysis will be published in a book chapter in 2023.

In all cases, faculty were instructed to focus their statements on professional disruptions, such as lab closures, travel restrictions, and increased teaching and advising workloads. Twenty-two percent of institutions prohibited faculty from mentioning personal circumstances such as increased caregiving responsibilities, but many others left the door open to such disclosures—a significant departure from standard tenure and promotion procedures. Normally, says Jessi Smith, a vice provost at the University of Colorado (CU), Colorado Springs, "The promotion and tenure process is really devoid of the human that is behind the package."

The decision to allow personal disclosures is well-intentioned, many argue, and could be an important step toward helping parents—the group that experienced the largest drop in productivity during the pandemic. But because stigma against motherhood lingers in academia, some worry that such disclosures could backfire. "In a healthy institution, where care is not seen as a negative thing … it should be easy enough for people to disclose," says Joya Misra, a professor of sociology and public policy and director of the ADVANCE program at the University of Massachusetts, Amherst. "But as long as people are at institutions where it is stigmatized, asking people to write about it could actually damage their long-term career prospects."

For some faculty members, it may also be risky to open up about any challenges, personal or professional. Black women, for example, "are expected to just do and be and show up no matter what's going on," says Christa Porter, an associate professor of higher education administration at Kent State University who has studied the experiences of Black women in academia. Their pandemic impact statements may not be viewed in the same light as similar statements written by, say, white men. Porter, who is also associate dean of the graduate college, took that concern into account during her own recent merit review. As a Black woman, she elected to not mention having children at home during the pandemic, even though some of her colleagues did so. "I just know it's going to be seen differently," she says.

> **"These issues are just going to get stickier and stickier."**
> **Dawn Culpepper**, University of Maryland, College Park

Misra has been leading workshops on her campus and elsewhere to train faculty to review pandemic impact statements equitably. She and her fellow trainers present case studies involving fictional professors and ask attendees to discuss how they would handle each case. "The idea is that if you think through enough cases before you start talking about colleagues in your department, you have a set of principles in mind," she says. That way, it's not about the person—it's about the situations they experienced. "I truly believe that every institution that has pandemic impact statements needs training on how to use them."

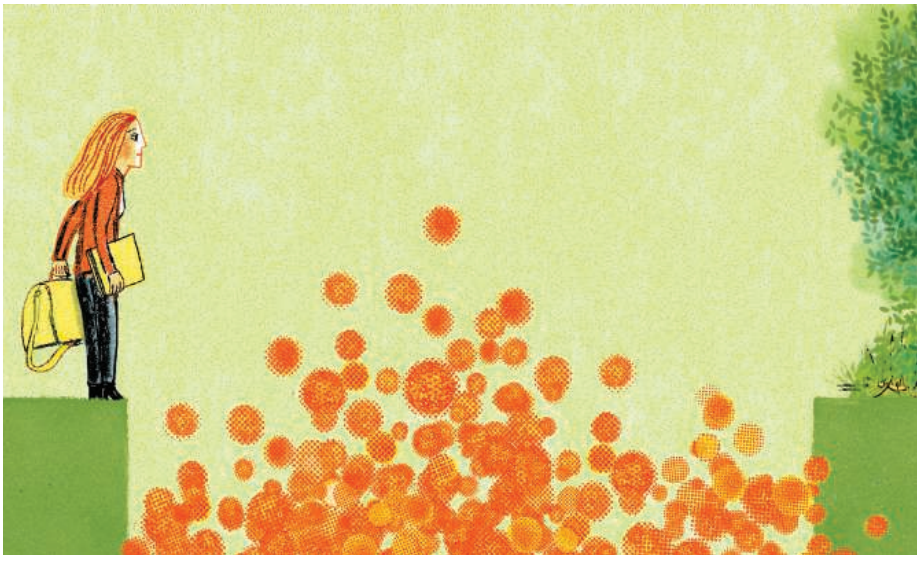

ILLUSTRATION: ROBERT NEUBECKER

Researchers are also concerned that inequities could arise from tenure delay policies, which went into place at more than 97% of research-intensive universities in the United States, according to a study by Culpepper and colleagues in press in the *ADVANCE Journal*. Proponents of these policies "really firmly believe that we just need to keep giving tenure delays, because people need to catch up," says a faculty member who requested anonymity to speak candidly about discussions with colleagues. They are "unable to pop out of this idea of how much people should have accomplished in a given time."

But others are pushing for a different approach: adjusting productivity expectations for tenure decisions. "The boat was not the same for everybody in the COVID storm," says Margaret Ptacek, a professor of biology and past director of the ADVANCE program at Clemson University. "We really need to look at how tenure and promotion policy and practices occur and make sure that there's a pathway for all different types of identities of faculty to have the potential for success." Critics also point to a 2018 study of tenure clock stoppage due to parental leave among economics professors, which found that when such policies were implemented from 1980 to 2005, they boosted tenure rates for men but reduced them for women—likely because some men continued to work during their leave.

"Continuing to wait until [a faculty member] 'catches up' just widens the power, access, and pay gaps that come with tenure and promotion," says Smith, whose research found that women and members of underrepresented racial and ethnic groups at her campus and CU Boulder were the most likely to accept tenure delays during the pandemic. "If we are going to do that," she continues, "then I would hope to see some sort of retroactive pay that gives those people the raise they would have received if they had gone up on time."

As things "return to normal," some worry that conversations about accounting for the pandemic's effects on academia, from current faculty to those still in training, are petering out prematurely. "We are still going to feel these impacts for a number of years, and in fact we probably haven't even seen them really play out. So there's even more reason to start paying attention to this and do so in a proactive way," Culpepper says. Going forward, "These issues are just going to get stickier and stickier."

"Universities did recognize that something needed to be done," Misra says. "But I don't see as much progress as I had hoped to see. I really hoped that it would lead to more of a transformation." ■