

SABOTAGE!

Postdoc Vipul Bhrigu destroyed a colleague's experiments to get ahead. It took a hidden camera to expose a little-known, malicious side of science.

BY BRENDAN MAHER

It is sentencing day at Washtenaw County Courthouse, a drab structure of stained grey stone and tinted glass a few blocks from the main campus of the University of Michigan in Ann Arbor. Judge Elizabeth Pollard Hines has doled out probation and fines for drunk and disorderly conduct, shoplifting and other mundane crimes on this warm July morning. But one case, number 10-0596, is still waiting. Vipul Bhrigu, a former postdoc at the university's Comprehensive Cancer Center, wears a dark-blue three-buttoned suit and a pinched expression as he cups his pregnant wife's hand in both of his. When Pollard Hines calls Bhrigu's case to order, she has stern words for him: "I was inclined to send you to jail when I came out here this morning."

Bhrigu, over the course of several months at Michigan, had meticulously and systematically sabotaged the work of Heather Ames, a graduate student in his lab, by tampering with her experiments and poisoning her cell-culture media. Captured on hidden camera, Bhrigu confessed to university police in April and pleaded guilty to malicious destruction of personal property, a misdemeanour that apparently usually involves cars: in the spaces for make and model on the police report, the arresting

officer wrote “lab research” and “cells”. Bhrigu has said on multiple occasions that he was compelled by “internal pressure” and had hoped to slow down Ames’s work. Speaking earlier this month, he was contrite. “It was a complete lack of moral judgement on my part,” he said.

Bhrigu’s actions are surprising, but probably not unique. There are few firm numbers showing the prevalence of research sabotage, but conversations with graduate students, postdocs and research-misconduct experts suggest that such misdeeds occur elsewhere, and that most go unreported or unpoliced. In this case, the episode set back research, wasted potentially tens of thousands of dollars and terrorized a young student. More broadly, acts such as Bhrigu’s — along with more subtle actions to hold back or derail colleagues’ work — have a toxic effect on science and scientists. They are an affront to the implicit trust between scientists that is necessary for research endeavours to exist and thrive.

Despite all this, there is little to prevent perpetrators re-entering science. In the United States, federal bodies that provide research funding have limited ability and inclination to take action in sabotage cases because they aren’t interpreted as fitting the federal definition of research misconduct, which is limited to plagiarism, fabrication and falsification of research data. In Bhrigu’s case, administrators at the University of Michigan worked with police to investigate, thanks in part to the persistence of Ames and her supervisor, Theo Ross.

“The question is, how many universities have such procedures in place that scientists can go and get that kind of support?” says Christine Boesz, former inspector-general for the US National Science Foundation in Arlington, Virginia, and now a consultant on scientific accountability. “Most universities I was familiar with would not necessarily be so responsive.”

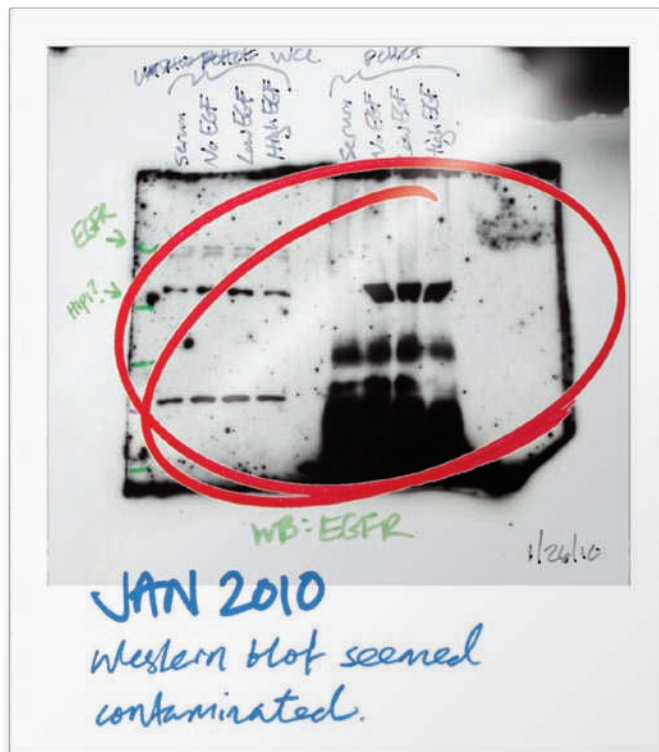
FIRST SUSPICIONS

Ames, an MD PhD student, first noticed a problem with her research on 12 December 2009. As part of a study on the epidermal growth factor receptor, a protein involved in some cancers, she was running a western blot assay to confirm the presence of proteins in a sample. It was a routine protocol. But when she looked at the blot, four of her six samples seemed to be out of order — the pattern of bands that she expected to see in one lane appeared in another. Five days later, it happened again. “I thought, technically it could have been my mistake, but it was weird that they had gone wrong in exactly the same way,” says Ames. The only explanation, she reasoned, was that the labelled lids for her cell cultures had been swapped, and she immediately wondered whether someone was sabotaging her work. To be safe, she devised a workaround: writing directly on the bottoms of the culture dishes so that the lids could not be switched.

Next, Ames started having an issue with the western blots themselves. She saw an additional protein in the sample lanes, showing that an extra antibody was staining the blot. Once again, it could have been a mistake, but it happened twice. “I started going over to my fiancé’s lab and running blots overnight there,” she says. As the problems mounted, Ames was getting agitated. She was certain that someone was monkeying with her experiments, but she had no proof and no suspect. Her close friends suggested that she was being paranoid.

Some labs are known to be hyper-competitive, with principal investigators pitting postdocs against each other. But Ross’s lab is a small, collegial place. At the time that Ames was noticing problems, it housed just one other graduate student, a few undergraduates doing projects, and the lab manager, Katherine Oravec-Wilson, a nine-year veteran of the lab whom Ross calls her “eyes and ears”. And then there was Bhrigu, an amiable postdoc who had joined the lab in April 2009.

Bhrigu had come to the United States from India in 2003, and completed his PhD at the University of Toledo, Ohio, under cancer biologist James Trempe. “He was an average student,” says Trempe. “I wouldn’t say that he was a star in the lab, but there was nothing that would make me question the work that he did.” Ross thought Bhrigu would be a good fit with her lab — friendly, talkative, up on current trends in the field. Ames says that she liked Bhrigu and at the time had



B. PUGLIANO/NATURE

little reason to suspect him. “He was one of the last people I would have suspected didn’t like me,” she says.

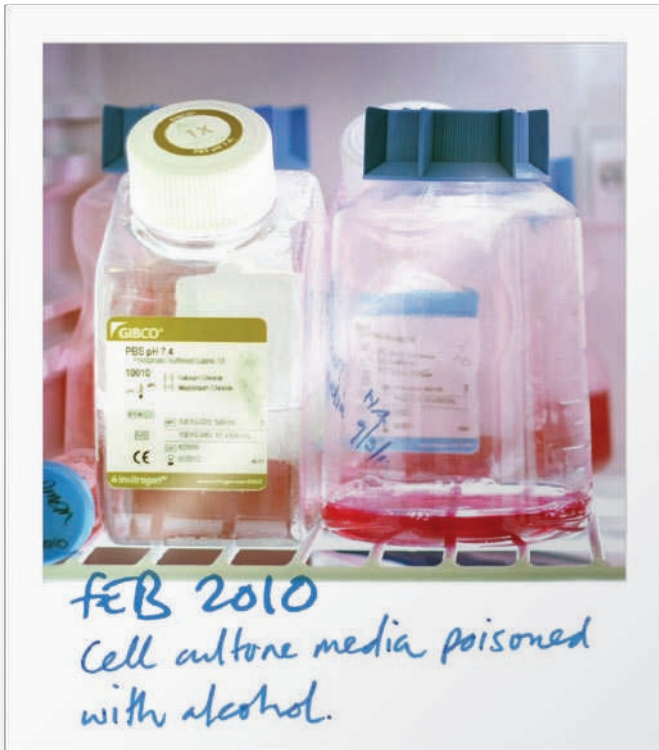
On Sunday 28 February 2010, Ames encountered what she thought was another attempt to sabotage her work. She was replacing the media on her cells and immediately noticed that something wasn’t right. The cells were “just dripping off the plate”, as if they’d been hit with something caustic. She pulled the bottle of medium out from the fume hood and looked at it. Translucent ripples, like those that appear when adding water to whisky, were visible in the dark red medium. When she sniffed it, the smell of alcohol was overpowering. This, she thought, was the proof she needed. “It was clearly not my mistake,” says Ames.

She fired off an e-mail to Ross. “I just found pretty convincing evidence that somebody is trying to sabotage my experiments,” she wrote. Ross came and sniffed the medium too. She agreed that it didn’t smell right, but she didn’t know what to think.

LAB INVESTIGATION

Some people whom Ross consulted with tried to convince her that Ames was hitting a rough patch in her work and looking for someone else to blame. But Ames was persistent, so Ross took the matter to the university’s office of regulatory affairs, which advises on a wide variety of rules and regulations pertaining to research and clinical care. Ray Hutchinson, associate dean of the office, and Patricia Ward, its director, had never dealt with anything like it before. After several meetings and two more instances of alcohol in the media, Ward contacted the department of public safety — the university’s police force — on 9 March. They immediately launched an investigation — into Ames herself. She endured two interrogations and a lie-detector test before investigators decided to look elsewhere.

At 4:00 a.m. on Sunday 18 April, officers installed two cameras in the lab: one in the cold room where Ames’s blots had been contaminated, and one above the refrigerator where she stored her media. Ames came in that day and worked until 5:00 p.m. On Monday morning at around 10:15, she found that her medium had been spiked again. When Ross reviewed the tapes of the intervening hours with Richard Zavala, the officer assigned to the case, she says that her heart sank. Bhrigu entered the lab at 9:00 a.m. on Monday and pulled out the culture media that he would use for the day. He then returned to the fridge with a spray



bottle of ethanol, usually used to sterilize lab benches. With his back to the camera, he rummaged through the fridge for 46 seconds. Ross couldn't be sure what he was doing, but it didn't look good.

Zavala escorted Bhrigu to the campus police department for questioning. When he told Bhrigu about the cameras in the lab, the postdoc asked for a drink of water and then confessed. He said that he had been sabotaging Ames's work since February. (He denies involvement in the December and January incidents.)

MOTIVES FOR MISCONDUCT

Misbehaviour in science is nothing new — but its frequency is difficult to measure. Daniele Fanelli at the University of Edinburgh, UK, who studies research misconduct, says that overtly malicious offences such as Bhrigu's are probably infrequent, but other forms of indecency and sabotage are likely to be more common. "A lot more would be the kind of thing you couldn't capture on camera," he says. Vindictive peer review, dishonest reference letters and withholding key aspects of protocols from colleagues or competitors can do just as much to derail a career or a research project as vandalizing experiments. These are just a few of the questionable practices that seem quite widespread in science, but are not technically considered misconduct. In a meta-analysis of misconduct surveys, published last year (D. Fanelli *PLoS ONE* 4, e5738; 2009), Fanelli found that up to one-third of scientists admit to offences that fall into this grey area, and up to 70% say that they have observed them.

Some say that the structure of the scientific enterprise is to blame. The big rewards — tenured positions, grants, papers in stellar journals — are won through competition. To get ahead, researchers need only be better than those they are competing with. That ethos, says Brian Martinson, a sociologist at HealthPartners Research Foundation in Minneapolis, Minnesota, can lead to sabotage. He and others have suggested that universities and funders need to acknowledge the pressures in the research system and try to ease them by means of education and rehabilitation, rather than simply punishing perpetrators after the fact.

But did rivalry drive Bhrigu? He and Ames were collaborating on one of their projects, but they were not in direct competition. Chiron Graves, a former graduate student in Ross's lab who helped Bhrigu learn techniques, says that Ross is passionate but didn't put undue stress on her personnel. "The pressures that exist in the system as

a whole are somewhat relieved in Theo's lab," says Graves, now an assistant professor running a teacher-education programme at Eastern Michigan University in Ypsilanti. "Her take was to do good science."

Bhrigu says that he felt pressure in moving from the small college at Toledo to the much bigger one in Michigan. He says that some criticisms he received from Ross about his incomplete training and his work habits frustrated him, but he doesn't blame his actions on that. "In any kind of workplace there is bound to be some pressure," he says. "I just got jealous of others moving ahead and I wanted to slow them down."

CRIME AND PUNISHMENT

At Washtenaw County Courthouse in July, having reviewed the case files, Pollard Hines delivered Bhrigu's sentence. She ordered him to pay around US\$8,800 for reagents and experimental materials, plus \$600 in court fees and fines — and to serve six months' probation, perform 40 hours of community service and undergo a psychiatric evaluation.

But the threat of a worse sentence hung over Bhrigu's head. At the request of the prosecutor, Ross had prepared a more detailed list of damages, including Bhrigu's entire salary, half of Ames's, six months' salary for a technician to help Ames get back up to speed, and a quarter of the lab's reagents. The court arrived at a possible figure of \$72,000, with the final amount to be decided upon at a restitution hearing in September.

Before that hearing could take place, however, Bhrigu and his wife left the country for India. Bhrigu says his visa was contingent upon having a job. A new hearing has been scheduled for October in which the case for restitution will be heard alongside arguments that Bhrigu has violated his probation.

Ross, though, is happy that the ordeal is largely over. For the month-and-a-half of the investigation, she became reluctant to take on new students or to hire personnel. She says she considered packing up her research programme. She even questioned her own sanity, worrying that she was the one sabotaging Ames's work via "an alternate personality". Ross now wonders if she was too trusting, and urges other lab heads to "realize that the whole spectrum of humanity is in your lab. So, when someone complains to you, take it seriously."

She also urges others to speak up when wrongdoing is discovered. After Bhrigu pleaded guilty in June, Ross called Trempe at the University of Toledo. He was shocked, of course, and for more than one reason. His department at Toledo had actually re-hired Bhrigu. Bhrigu says that he lied about the reason he left Michigan, blaming it on disagreements with Ross. Toledo let Bhrigu go in July, not long after Ross's call.

Now that Bhrigu is in India, there is little to prevent him from getting back into science. And even if he were in the United States, there wouldn't be much to stop him. The National Institutes of Health in Bethesda, Maryland, through its Office of Research Integrity, will sometimes bar an individual from receiving federal research funds for a time if they are found guilty of misconduct. But Bhrigu probably won't face that prospect because his actions don't fit the federal definition of misconduct, a situation Ross finds strange. "All scientists will tell you that it's scientific misconduct because it's tampering with data," she says.

Still, more immediate concerns are keeping Ross busy. Bhrigu was in her lab for about a year, and everything he did will have to be repeated. Reagents that he used have been double-checked or thrown away. Ames says her work was set back five or six months, but she expects to finish her PhD in the spring.

For her part, Ames says that the experience shook her trust in her chosen profession. "I did have doubts about continuing with science. It hurt my idea of science as a community that works together, builds upon each other's work and collaborates." Nevertheless, she has begun to use her experience to help teach others, and has given a seminar about the experience, with Ross, to new graduate students. She says that the assistance she got from Ross and others helped her cope with the ordeal.

"It did help restore the trust," she says. "In a sense I was lucky that we could catch it." ■

Brendan Maher is Nature's biology features editor.