AFTER ALL FOUR OF HER BABIES DIED IN THEIR SLEEP OVER THE COURSE OF A DECADE, KATHLEEN TOUBIGG WAS CONVICTED OF MURDER. BUT ONE TENACIOUS SCIENTIST SUSPECTED THE REAL CULPRIT WAS A MUTANT STRAND OF DNA.

HER QUEST TO PROVE IT TURNED INTO A GENETIC AND PERSONAL SHOWDOWN.

BY OSCAR SCHWARTZ

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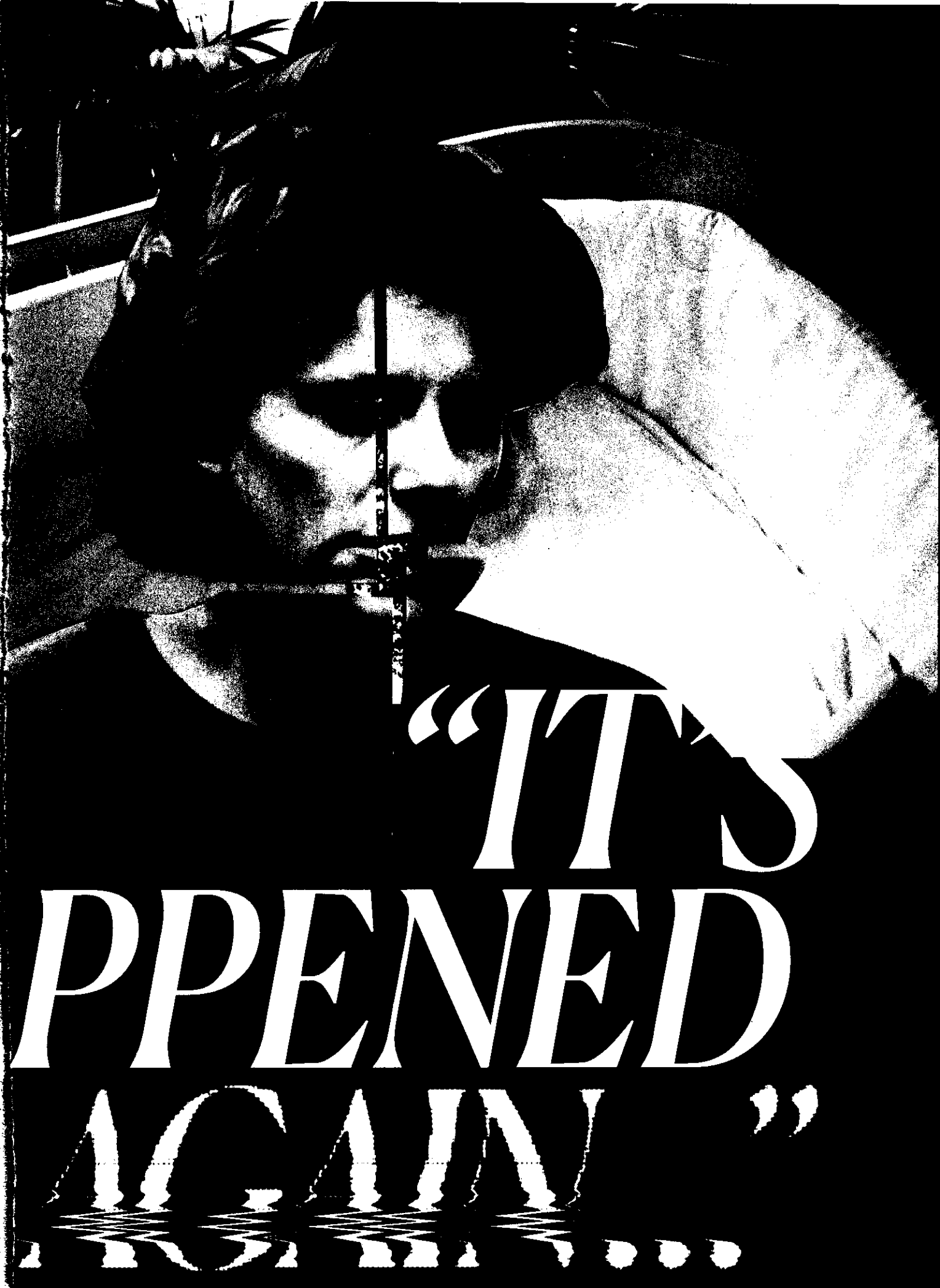

"IT'S
PPENED
AGAIN..."

ON A WEDNESDAY MORNING IN AUGUST OF 2018,

Carola Garcia de Vinuesa was on her feet at a paper-strewn standing desk in her light-filled office in Canberra when the phone rang. The caller was a former student in the immunology department at the Australian National University, where Vinuesa worked. She hadn't known the caller well, but she knew he was bright. And he had a story to tell.

In the span of 10 years, he told her, four babies in one Australian family had died in their sleep. The oldest was just a year and a half. No one had found evidence of violence. But in 2003, the babies' mother, Kathleen Folbigg, was convicted of smothering all of them to death. The 36-year-old, now considered the most prolific female murderer in Australian history, was sentenced to 40 years in prison.

The thing is, the student told Vinuesa, the trial didn't sit right with several medical and legal experts. They thought the prosecution had presented some dubious medical evidence that was damning to Folbigg. Now Folbigg's legal team had convinced the New South Wales governor's office to reassess the case.

Vinuesa paced as she listened. She hadn't heard of Folbigg. The student on the phone, now a health lawyer, kept going. He told her he was working with Folbigg's legal team, and he wondered if Vinuesa, who used advanced genome-sequencing equipment to study the causes of rare diseases, might help. Would she examine DNA samples of the four dead children? Perhaps she could find something of use to their case? She agreed to take a look.

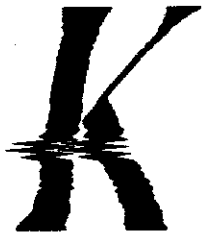
He emailed her a hefty bundle of case files, and Vinuesa skimmed through them: pathology reports, forensic reports, death certificates, medical records. As she browsed, she was struck by a few curious details. One of the boys had been diagnosed with a floppy larynx before he died. One of the girls had inflammation of the heart muscle. Either condition could contribute to the sudden death of an infant, Vinuesa thought, and yet the deaths had been deemed foul play. That struck her as odd. She closed the files and continued with her workday.

At 3 pm, Vinuesa climbed into her car and drove through the tree-lined streets of Canberra's suburbs to pick up her two daughters from school. A single mother, Vinuesa spent the next three hours shuttling them to and from soccer practice. Later that night, once the

girls were doing their homework, Vinuesa sank into a sofa, opened her laptop, and reread the Folbigg family's medical records, this time more carefully.

She immediately saw parallels with a case she'd worked on just a month earlier. Four infants in a Macedonian family had died, and no one could figure out why. After examining their DNA, Vinuesa found three genetic mutations in the children that together were almost certainly lethal. The combination was also exceptionally rare: She had estimated there was a 1 in 64,000 chance that the genes would show up in four siblings. Yet there they were. Now, scrolling through the documents on her screen, Vinuesa thought a similarly rare event might have struck the Folbiggs.

That evening she wrote an email to Folbigg's lawyer and said she was in. As she dug into the investigation, she assumed that her scientific work would help guide the legal system closer to the truth. She had no idea that over the course of two all-consuming years, she would end up confronting painful questions about her own life—as a scientist and as a parent. In her email to the lawyer, she wrote, "As a mother, I cannot think of any more worthy cause to invest time and effort in. I find it hard to believe there is someone sitting in jail for this."



Kathleen Megan Briton was born in the winter of 1967 in the working-class neighborhood of Balmain, Sydney. Her father, Thomas, was a hoist driver at the nearby docks. Her mother, Kathleen (whom she was named after), worked in a factory. Thomas was violent; Kathleen drank a lot. After one particularly vicious fight, Kathleen fled, leaving her little girl, just 18 months old, with Thomas. A few weeks later, in a drunken rage, Thomas ambushed his wife in the street and demanded she come home. When she refused, he stabbed her 24 times with a 25-centimeter-long carving knife. As she lay dying, he cradled her in his arms, kissing her face while he waited for the police to arrive.

For a year, baby Kathleen was put in the care of her aunt and maternal grandmother. Then she was sent to a children's home, and from there to a foster family in Newcastle, a coal mining town 100 miles north of Sydney. The new family fed and clothed Kathleen and sent her to school, but her foster mother was tough and, according to court documents, hit her with the handle of a feather duster when she misbehaved. Her foster father was distant. When she was 17, Kathleen left high school and moved in with a friend. One weekend, she was out dancing at a club when she met a handsome man named Craig Folbigg. He was 23, well-spoken, and worked as a forklift driver at the biggest mining company in town. They started dating, fell in love, and soon moved into an apartment in a suburb of Newcastle. Craig, who came from a big Catholic family, had lost his mother as a teenager. He was eager to start a family. Kathleen, too, longed for stability.

In 1987, when Kathleen was 20 years old, the couple got married. A year and a half later, in early February 1989, Kathleen gave birth to their first child. They named the boy Caleb. On February 20, Kathleen remembers getting up to feed the baby at 1 am and then going back to sleep. About two hours later she woke to go to the bathroom and went to check on him. Caleb was not breathing. "My baby, there is something wrong with my baby," she screamed. Craig dashed over and attempted CPR, and he told Kathleen to call an ambulance. Paramedics were unable to resuscitate the boy. He was pronounced dead at 19 days old.

The Folbiggs' second child, Patrick, was born a year later. Late one night when he was 4 months old, Kathleen heard Patrick coughing. She went to his crib to comfort him, and he fell back asleep. Around 4:30 am, she looked in on him and saw that he was limp, blue, not breathing. Craig again attempted CPR while Kathleen called for paramedics. They arrived quickly and rushed the baby to the hospital, where he was resuscitated. The doctors at the hospital concluded that Patrick had suffered what is known as an "apparent life-threatening event," a mysterious syndrome that primarily affects children under the age of 1. Patrick was left with brain damage that caused partial blindness and regular seizures—and would now require almost constant supervision. Kathleen, who had been hoping to return to work after his birth, decided to stay home to care for the boy while Craig worked a demanding new job at a local car dealership. About four months later, on February 13, 1991, Kathleen called Craig at work, frantic. "It's happened again," she cried. "I need you." By the time Craig got home, Patrick had died. He was 8 months old.

In October 1992, Kathleen gave birth to a third child, and the couple named her Sarah. This time, the Folbiggs moved Sarah's bed into their bedroom so they could keep a close watch on her as she slept. On August 30, 1993, Craig put Sarah to bed around 10:30 pm. A few hours later, Kathleen remembers going to check on her and listening for her breath. When she heard nothing, she turned on the light. Sarah was blue and motionless. She was pronounced dead at 10 months and 16 days old.

Three years passed. The Folbiggs moved to a new house. Their relationship was strained. Kathleen had gained weight and worried Craig would leave her. She became obsessive about dieting and going to the gym.

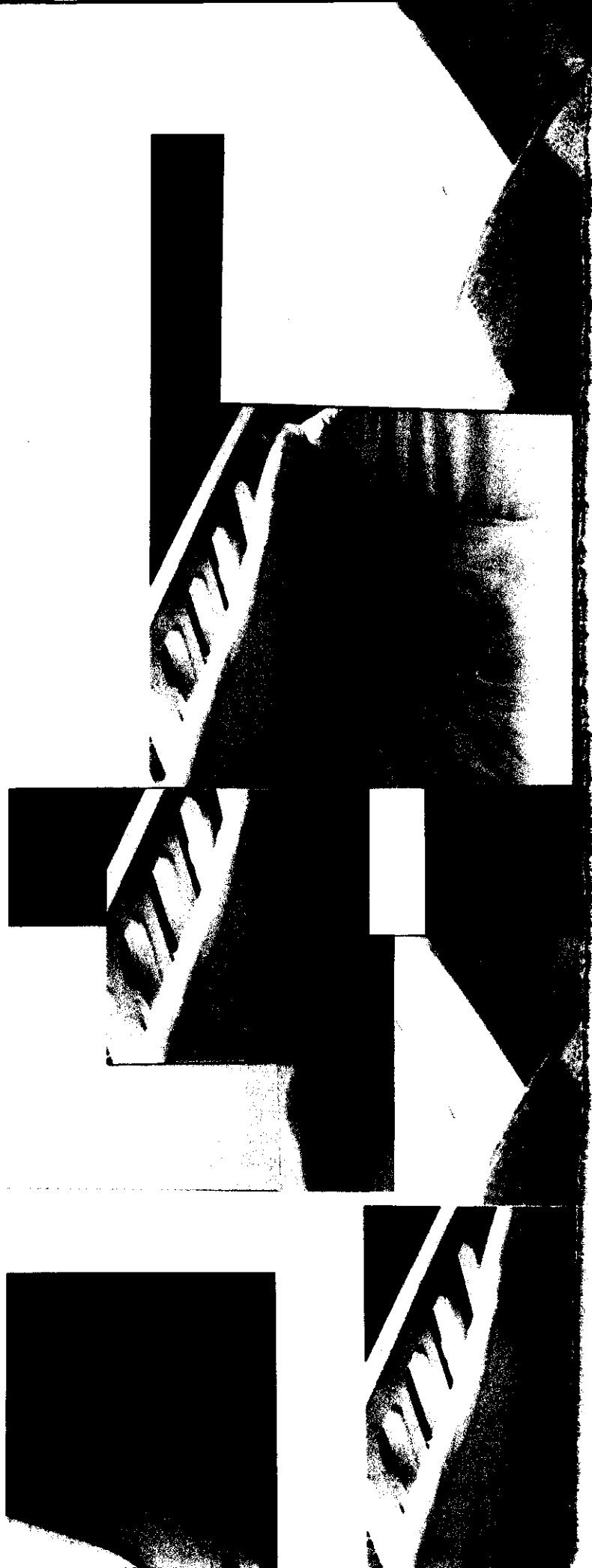
The couple moved yet again, to a town an hour's drive west of Newcastle. Shortly after that, Kathleen, now 30, got pregnant one more time. Laura was born on August 7, 1997. When she was 12 days old, doctors did a full medical investigation. They took blood samples, conducted a sleep test, and checked her for inherited metabolic disorders. Everything came back normal. Even so, doctors sent the Folbiggs home with a heart monitor that relayed data directly to the hospital. Laura was a calm, healthy baby, and she thrived. For her first birthday, the Folbiggs threw her a big party and invited all the neighbors. Around seven months later, Kathleen put Laura down for a morning nap. Soon after, an ambulance was on the way to the house. Paramedics found Laura lying on the breakfast counter. She wasn't breathing; she had no pulse. Laura died on the first day of March 1999, at 18 months and 22 days.

The day Laura died, detective senior constable Bernard Ryan, a clean-shaven 31-year-old, got assigned to the case. Up until then, there had been virtually no conversation about infanticide. Autopsies of the first three Folbigg children determined that each baby died of natural causes. Caleb's and Sarah's deaths were attributed to sudden infant death syndrome—meaning the deaths were unexplained but didn't appear suspicious. Patrick's was designated as asphyxia caused by an epileptic seizure.

Laura's was different. Although her autopsy turned up evidence of myocarditis, an inflammation of the heart muscle, the forensic pathologist declared her death "undetermined," a designation that left open the possibility of foul play. He wrote: "The family history of no living children following four live births is highly unusual," adding, "The possibility of multiple homicides in this family has not been excluded."

Two weeks after Laura's death, Ryan received a letter. It was from the doctor who had seen Laura at the hospital where she was declared dead. The doctor knew of the baby girl's ill-fated siblings and suggested Ryan consider a murder investigation into all four babies. The Folbiggs, meanwhile, struggled with their grief. Craig fell into a debilitating depression. Kathleen, trying to manage her anguish, spent a lot of time at the gym. They went to couples counseling. In April 1999, six weeks after Laura died, Kathleen moved into a separate apartment on the other side of town.

One evening in May, Craig was cleaning up Kath-



IN HER DIARY, KATHLEEN FOLBIGG WROTE, "I FEEL LIKE THE WORST MOTHER ON THIS EARTH."

leen's belongings when he found a diary that she'd written from June 1996 to June 1997. He sat down and started to read. The entries revealed a side of his wife that Craig hadn't known. In one entry from October 1996, just before she became pregnant with Laura, Kathleen had written about some of her past mistakes: "Obviously, I'm my father's daughter." A few months later, during a sleepless night, she wrote: "My guilt of how responsible I feel for them all, haunts me, my fear of it happening again haunts me ... what scares me most will be when I'm alone with the baby. How do I overcome that? Defeat that?" Two months before Laura was born, Kathleen wrote about her fear that she had repressed some troubling memory. "Heaven help the day they surface & I recall," she scribbled. "That will be the day to lock me up & throw away the key. Something I'm sure will happen one day."

As he read, Craig felt like he was going to throw up. A few days later, he took the diary to the police station and sat down with Constable Ryan. In an extensive interview, Craig expressed—for the first time—some suspicion about Kathleen's account of Sarah's death. Ryan asked him to return four days later.

After the interview, Craig drove to see Kathleen at her new apartment and told her what he had done. He accused her, for the first time, of killing their babies. She slammed the door in his face. Later, she jumped in her car and drove to his house. "How could you say those things about me," she said. "You know I loved them ... You've got to tell the truth." When Craig returned to the police station for his second interview, he recanted. Soon, Craig and Kathleen reconciled, and she moved back in with him.

In July 1999, in a cream-colored interview room at the police station, Ryan questioned Kathleen for nearly eight hours. He read out excerpts from her diary. She told him they were expressions of the inadequacy and guilt that all mothers experience—compounded by the trauma of having lost three babies. When Ryan asked what she meant by saying she was her father's daughter, she said that in her eyes her father was a loser, and that she took after him.

The detective got a warrant to search the Folbiggs' house. He asked Kathleen if she had more diaries. She said she had just bought a new one the day before, and she handed it over. But another officer searched the main bedroom—and discovered yet another diary. "I didn't know it was there," Kathleen said. "I thought it was gone."

This one was written between June 1997 and April 1998. Reading through it, Ryan stopped on a page dated January 28, 1998. Kathleen had become so angry at Laura, she wrote, that she "nearly purposely dropped her on the floor & left her." She went on: "I feel like the worst mother on this earth. Scared that she'll leave me now. Like Sarah did. I knew I was short tempered & cruel sometimes to her & she left. With a bit of help."

On April 19, 2001, officers arrived at the Folbiggs' house and took Kathleen to a police station, where she was charged with the murder of Caleb, Patrick, Sarah, and Laura. She was granted bail in May. Two years later, the case went before a judge and jury at the New South Wales Supreme Court in Sydney. During the seven-week trial, prosecutors argued that Folbigg had smothered all four of her children to death. Lacking physical evidence, the crown prosecutor leaned heavily on the diaries. He also emphasized the sheer improbability of four natural infant deaths. Three medical experts testified they had never seen or read about even three SIDS deaths in one family.

The prosecutor's argument was at least partially inspired by a British pediatrician named Roy Meadow. Beginning in the 1970s, Meadow had proposed that whenever a family had multiple unexplained infant deaths, attention-seeking mothers were often to blame. He called it Munchausen syndrome by proxy. In 1989, in a book titled *ABC of Child Abuse*, Meadow summed up this position in a morbidly catchy maxim—"One sudden infant death is a tragedy, two is suspicious, and three is murder until proved otherwise." He went on to use "Meadow's law" in several high-profile infanticide trials in the UK, including that of a lawyer named Sally Clark whose two infant sons died within a few months of their births. At trial, Meadow testified that the chance of such a tragedy occurring naturally was 1 in 73 million. Clark was sentenced to life in prison.

The crown prosecutor at Kathleen Folbigg's trial didn't explicitly introduce Meadow's law into the courtroom, but its logic echoed through his case. In his closing statement, he said that although he couldn't disprove four natural infant deaths in one family, he also couldn't disprove that "one day some piglets might be born from a sow, and the piglets might come out of the sow with wings on their back." After close to nine hours of deliberating, the jury came back with a verdict. Guilty. When she heard it read aloud, Folbigg collapsed to the floor and wailed.

Folbigg was sent to a maximum-security prison outside Sydney called Silverwater Correctional Complex. There, she was locked in her cell for 22 hours a day to protect her from other inmates—"baby killers" are often targets for violence in women's prisons—and to prevent her from harming herself.

For months, Folbigg's story remained a constant in Sydney's newspapers. Journalists dug up intimate details about Folbigg's childhood, including the tragic story of her mother's death at her father's hand—information that had been excluded from the trial so as not to sway the jury. A childhood friend of Folbigg's named Tracy Chapman, a counselor, told me that Craig's extended family and Folbigg's own foster sister had renounced her, publicly. After she was imprisoned, Folbigg wrote a letter to her foster sister; she said she felt like "the most hated woman alive." Her foster sister handed the letter over to a journalist at *The Daily Telegraph*, adding that she agreed with the court's verdict—her sister was a "monster." Only a few close friends stood by Folbigg, including Chapman. "She was seen as a liar, bitch, witch—and everyone bought into it," Chapman said.

Except on that last point, Chapman wasn't entirely right. There were people out there with doubts. In the early 2000s, Emma Cunliffe, a law student at the University of British Columbia, was looking into the infamous case of Lindy Chamberlain, who in the 1980s claimed a dingo took her baby. Chamberlain was found guilty of murdering her daughter and then later acquitted. Cunliffe's thesis was that Chamberlain was found guilty largely due to her "strange behavior" following her child's disappearance—her apparent stoicism, her decision to write "a dingo took my baby" in a visitor's book in a local store. The prosecution had used those details to paint her as a bad mother. In her research, Cunliffe had come across Folbigg's case, and she procured the transcripts from the trial. As she read, she started to see similar dynamics.

In 2003, Cunliffe started a PhD program—and focused on wrongful convictions for unexplained infant

THEY LOOKED UP AT EACH OTHER AND SAID, ALMOST IN UNISON, "CALM2."

deaths. She quickly came across a public statement made by England's Royal Statistical Society criticizing Roy Meadow's testimony in the Sally Clark case. Meadow's law assumed that multiple SIDS deaths arise independently within a family. The society didn't agree: "There are very strong a priori reasons to suppose that the assumption will be false," its statement said. Genetic or environmental factors might increase the likelihood of a second case within a single family. In part because of this new evidence, Clark was released from prison in 2003. Her case also prompted the attorney general to order a review of 258 other cases where parents or caregivers were convicted of murdering infants on similar evidence. Three women were subsequently released. In 2005, Meadow was struck from the British medical register, barring him from practice. (This decision was later overturned by the High Court, which ruled that even though he'd been inaccurate, Meadow had "acted in good faith.")

Meanwhile, more research on SIDS was emerging, including documentation of several families who had lost three children with no foul play. In 2011, Cunliffe published a book called *Murder, Medicine and Motherhood*. In it, she wrote that Kathleen Folbigg had "suffered from a moment in history where unexplained infant deaths had been disproportionately blamed on the mother."

By the time the book was published, Folbigg had been in prison for nine years. She had exhausted her rights of appeal in the court system. But she still had another option: directly petitioning New South Wales' attorney general to open an official inquiry into her murder convictions. To overturn the ruling, Folbigg and her legal team would need to raise doubts about the evidence presented in her original trial. In 2013, a team of lawyers in Newcastle, where the Folbiggs had lived, took on her case. They enlisted several medical experts, including Stephen Cordner, a renowned forensic pathologist at Melbourne's Monash University. Coincidentally, Cordner had reviewed Cunliffe's book when it was published and had found its argument compelling.

Over the next 15 months, Cordner studied the medical evidence presented at Folbigg's trial. He made note of Caleb's floppy larynx, which can make it hard for an infant to breathe. Patrick had had seizures that were sufficiently severe to account for a sudden death. Sarah's case appeared to be an almost textbook example of SIDS. And Laura's case of myocarditis, if taken on its own, would have been an uncontroversial natural explanation for her death, he thought. Cordner wrote up a 112-page report arguing that the facts more strongly supported natural causes than smothering—the evidence for which was zilch. In a veiled criticism of the expert testimony from 2003, he wrote, "There is no merit in forcing certainty where uncertainty exists."

In June 2015, Folbigg's legal team delivered an official petition, including Cordner's report, to the attorney general's office in Sydney, where it sat for three years. Finally, on August 22, 2018, attorney general Mark Speakman announced that an official inquiry would take place the following year. A judicial officer—Reginald Blanch, a 75-year-old former District Court judge—would reassess the evidence.

Carola Garcia de Vinuesa received the call from her former student just days after the announcement that Kathleen Folbigg's case would be looked at again. Because the legal team did not yet have access to the children's DNA, Vinuesa started her investigations with Folbigg herself. She enlisted the help of a trusted colleague, a geneticist named Todor Arsov. In October 2018, Arsov visited Folbigg in prison, where he conducted a clinical history, took a saliva sample, and swabbed the inside of her cheek. A technician in Vinuesa's lab extracted her DNA from the samples and put it through a genetic sequencing machine.

On the last day of November, Folbigg's genome sequence was ready for review. Vinuesa invited Arsov to spend the weekend at her house, where she lived with her two teenage daughters, so they could analyze the data and compare notes right then and there. That Sunday afternoon, the two scientists sat at the breakfast counter and opened the DNA file on their laptops. They searched through the nucleotides that made up Folbigg's genes for any mutations that might suggest disease.

Half an hour later, they looked up at each other and said, almost in unison, "CALM2."

CALM2 is one of three genes in the calmodulin family, which among other things help regulate the heart's expansions and contractions. Vinuesa and Arsov had both found a mutation in Folbigg's CALM2 gene. This seemed significant: Other calmodulin variants were associated with severe cardiac disorders and sudden death in infancy. The two searched the medical literature for any mutation of the mutation they'd just discovered and found nothing. They had no way of knowing if it was meaningful. Nor did they know if the children had inherited it.

Even so, they felt they had stumbled on an astonishing lead.

Reading through the literature on CALM gene varia-

tions, Vinuesa learned that many of them were linked with Long QT syndrome, which can cause fast, chaotic heartbeats, and can be life-threatening. When Vinuesa ran a simulation designed to predict the riskiness of a given mutation, the results suggested that Folbigg's genetic quirk was likely also dangerous.

Vinuesa thrived on this detailed and creative work; she didn't mind that she was doing it all unpaid and on her own time. According to Arsov, searching a genome for undiscovered variants and matching them to mysterious diseases is as much an art as a science, requiring a mind that is tenacious and open to oblique possibilities. Vinuesa, he told me, has a unique talent for such painstaking investigations. But there was something more at play than the joy of scientific discovery.

Vinuesa's father, a religious and austere lawyer who came from a lineage of Spanish judges, believed in serving society. For years, he worked as a state treasury inspector in Spain's first democratic government, formulating policies to redistribute wealth in the young, post-Franco society. He loomed large in Vinuesa's life, and when she was young she made choices that echoed his. As a medical student, she worked in a leprosy clinic on the shores of the Ganges in Calcutta. After that, she helped train health workers in rural Ghana. When she was there, children were constantly being admitted to the hospital for meningitis; the disease had essentially no preventative measures. She decided her time would be better spent in a lab, hunting for the cause of the deadly affliction. "I craved to understand and not just to treat this disease," she says. "What was needed was better research, not more doctors in Africa."

At the University of Birmingham, in the UK, she investigated the biological mechanisms of meningitis and earned a doctoral degree in immunology. After graduating, she went to work at the Australian National University, to be near a man she'd fallen in love with. In 2014, she won a grant to open the Centre for Personalised Immunology and became one of the first in Australia to use advanced genomic sequencing technology to hunt for links between disease and genetic variation.

By the time she started working on the Folbigg case in 2018, she had been awarded two of Australia's most prestigious science awards, for discovering a variant associated with autoimmune disease. Professionally, Vinuesa had little to gain from spending her free time investigating the genome of a convicted killer. But seeing that mutation in the CALM2 gene triggered in her a sense of duty.

In December, Vinuesa finished her report on the CALM2 variant and sent it to Folbigg's lawyers. They passed it on to inquiry officials in the government. Soon, Vinuesa was traveling to Sydney to meet with a handful of other scientists who had been assigned to the case. Officials with the New South Wales attorney general's office had asked these scientists—some of whom worked for the government—to conduct a separate genetic investigation. Among them were Michael Buckley, a genetic pathologist; Alison Colley, a clinical geneticist; and Matthew Cook, Vinuesa's longtime colleague at the Centre for Personalised Immunology.

VINUESA SPENT HER NIGHTS AND WEEKENDS OBSESSING OVER THE FOLBIGG CASE AND RESEARCHING THE CALM GENES.

The meeting, held in a government building in Sydney, began cordially. Gail Furness, a prominent barrister who was helping to lead the inquiry, explained that the purpose of the meeting was to determine what had changed in the field of genetics since 2003. Scientists now knew of many more DNA variants associated with sudden infant death; in fact, up to half of the deaths once considered unexplained could now be ascribed to a genetic cause. The experts agreed that a new genetic investigation was essential.

Vinuesa, eager to share her results on CALM2, told them what she'd found. To her surprise, she sensed in a few of the scientists in the room some conservatism—even animosity—toward her approach. Buckley, for one, argued that because Kathleen was healthy, the mutation was likely not dangerous. Vinuesa disagreed with that assumption. "For all we know, there could be something in Kathleen and she might have long QT syndrome," she said. Buckley retorted: "I will base my submissions to the inquiry based on published evidence rather than speculation."

Two months later, the geneticists gathered again in Sydney—and again they clashed. They were gearing up to analyze the children's DNA, but they couldn't agree on how to categorize any mutations they might uncover. Buckley proposed using criteria from the American College of Medical Genetics and Genomics: A gene variant would be "likely pathogenic" if the certainty that it causes disease is greater than 90 percent. Though she agreed at the time, Vinuesa found this a strange choice. In a clinical setting, when deciding whether a patient should undergo a certain treatment, the stringency makes sense, she thought. But this wasn't a clinical setting. Vinuesa believed that her job was to see if the genetic evidence *raised doubt* as to the cause of death in any of the four children.

As the meeting went on, Vinuesa grew increasingly uncomfortable. Using Buckley's proposed criteria would be limiting and might exclude the CALM2 variant before they even knew what it did. Cook, Vinuesa's colleague, agreed with her assessment. During the meeting, Furness divided the geneticists into two groups: the Sydney team, led by Buckley—an employee of the New South Wales government—and the Canberra team, comprising Vinuesa, Cook, and Arsov. They would carry out

separate analyses and write their own reports for the inquiry. (All members of the Sydney team declined to comment for this story.)

In February 2019, the teams received the sequenced DNA of the four children, derived from blood pinpricks at their birth. The geneticists scoured the data. By March, both teams found in Laura and Sarah precisely the same CALM2 mutation.

Vinuesa and Cook wrote a report saying the novel CALM2 variant was "likely pathogenic." The Sydney team called it a "variant of uncertain significance," on the grounds that Folbigg and the two girls had not displayed any cardiac symptoms. Vinuesa was disappointed—to her, it seemed clear the children's deaths themselves may have been the symptom.

In March, the Folbigg inquiry hearings began at the Forensic Medicine and Coroner's Court in Sydney's western suburbs. Vinuesa and several of the other geneticists came to testify. The members of the Sydney team were seated on an elevated platform next to Blanch. Vinuesa and Arsov were instructed to sit to the side at a small table. She couldn't help but feel "as if we were second class," she says.

Furness, the lead counsel, stood in the middle of the room as she interrogated the scientists. With Vinuesa, she began by probing her credentials: Was Vinuesa qualified to make clinical diagnoses, or was she running a medical practice in Australia? She wasn't. "So, you haven't been doing it from a clinical outcome perspective, is that right?" Furness asked, referring to her genetic assessments. "That's correct," Vinuesa responded. "From a research perspective?" Furness continued. "That's correct."

Vinuesa was rattled. It was true, she was not a clinician anymore, but she *was* a leading expert in the discovery of genetic disease. "I was introduced in a way that was disqualifying from the outset," she told me. "I felt it, and I was so angry." After grilling Vinuesa, the barrister did the same to Arsov.

A little while later, a pediatric cardiologist named Jonathon Skinner, who had assessed the cardiac health records of Folbigg and her children, was called to testify. At one point, Furness asked him about the CALM2 gene. Skinner responded that because Folbigg showed no evidence of cardiac disease, to suggest it had killed her daughters was "stretching credibility." The hearing adjourned for lunch. When it resumed, Furness again questioned Arsov. He recounted how Folbigg had told him that as a teenager she had fainted during a swimming race and been dragged from the pool. Furness turned to Skinner: "Professor Skinner, does that mean anything to you?" He replied that sudden loss of consciousness, particularly while swimming, is a clear symptom of Long QT syndrome. "I think this is a really important event that we need more detail about," he said.

That evening in her hotel room, Vinuesa thought about the day with growing disquiet. Skinner himself had coauthored clinical guidelines on diagnosing Long QT syndrome, one of which was that a doctor should ask a patient about unexpected fainting while swimming. Vinuesa wondered if Skinner had been negligent in his initial assessments. The next morning at the hearing, she brought up the swimming incident and drew attention to its clinical significance. But the Sydney team didn't back her up. When it was Alison Colley's turn to speak on the issue, the geneticist responded with a meandering comment about how Folbigg might have been dehydrated or overwhelmed. "It was so unprofessional," Vinuesa told me.

In the weeks after her testimony, Vinuesa spent several sleepless nights going over what had happened in court. At one point, a member of the Sydney team emailed her to say that Furness, the lead counsel, told him the only result that mattered was that "neither you nor we found anything that clearly explained the four deaths." The "clearly explained" was telling, she thought. The Sydney geneticists were looking for near certainty that a genetic flaw had killed the children, rather than merely reasonable doubt as to whether their mother was the culprit.

But Vinuesa's goal was to cast doubt on the prosecution's original argument that four unexplained infant deaths implied murder. She was hunting for alternate possibilities. She could tell that the Sydney team found her focus on the exceedingly rare, barely known CALM2 mutation frustrating. In conversations with those other geneticists, Vinuesa felt that they were relieved the process was finally over—that they could be done with it.

Vinuesa had the opposite reaction. As a mother, she could not bring herself to ignore this new evidence, which suggested that at least two of Folbigg's children might have died of natural causes.

One night, when she was home and obsessing over the case, Vinuesa emailed a handful of cardiac geneticists for their opinion on the CALM2 variant. One of them was Peter Schwartz, a cardiovascular geneticist at Italy's Istituto Auxologico and an expert on life-threatening heart defects caused by mutations of the CALM genes.

When Schwartz replied, his email held a bombshell: He had just published a paper reviewing the International Calmodulin Registry, a large, collaborative effort to enlist every person with a disease-causing mutation in the CALM genes. One family, he wrote, had a variant in another CALM gene that looked almost identical to the Folbigg mutation. In this family, two children had suffered cardiac arrest at ages 4 and 5, and one of them had died. Their mother, from whom they inherited the mutation, was seemingly healthy. The two families' similarities gave him "significant doubts" about Folbigg's conviction. "My conclusion is that the accusation of infanticide might have been premature and not correct," he wrote.

"Oh my God, this is it," Vinuesa thought on reading

"IF THIS HAPPENED TO ME," VINUESA THOUGHT, "I'D HATE THE WHOLE WORLD."

the email. She immediately typed up a brief report and sent it to inquiry officials. They, in turn, passed it to the Sydney team. In early July, the Sydney team responded: The discovery of the other family meant, they said, that the Folbigg variant was now considered "likely pathogenic." But they still did not consider it a plausible cause of death for Sarah and Laura. The two girls had been uncommonly young to suffer from inherited cardiac arrhythmias, they noted. Second, they died while sleeping, but cardiac deaths tend to occur during periods of exertion or stress. Finally, they added that in the months since Skinner's testimony, a clinician had visited Folbigg in prison to conduct a cardiac assessment. Skinner reviewed the results and found "no evidence of Long QT syndrome."

When Vinuesa saw the Sydney team's response, she fumed. In genetics, explaining unlikely events was the norm. If the Sydney team was not willing to accept the possibility of a rare event, why had they agreed to take part in the inquiry? "They seemed to have made their minds up and were not willing to accept this new evidence," she said. "It just went explicitly against the scientific method."

She started crafting a reply. She turned to the International Calmodulin Registry—and found that every one of the Sydney team's arguments was, in her view, wrong or misleading. She found nine reported cases of sudden cardiac death in infants below the age of 3. She discovered that up to 20 percent of sudden cardiac deaths occurred during sleep. And she identified five families in which inherited CALM mutations were benign in some members and pathogenic in others. Sarah and Laura's deaths fit a pattern in the medical literature. Triumphant, Vinuesa wrote up her findings and sent them to the inquiry.

"I was convinced that was it, Folbigg was going to be let out of jail," she told me.

Reginald Blanch, the judicial officer presiding over the inquiry, was left with a decision to make. The Sydney team and the Canberra team had submitted conflicting expert opinions. When Blanch delivered his decision in July of 2019, his language was unmistakably subjective. With respect to the CALM2 variant, he wrote, "I prefer the expertise and evidence of Professors Skinner and Kirk and Dr Buckley."

Blanch then returned to the diaries to make his final decision. During the inquiry, Folbigg had been called to testify and was cross-examined by a state-appointed barrister. After reading out excerpts from the diary, he said: "You did kill them all, didn't you?" Folbigg sobbed. "No, I didn't kill my children," she replied, "and these diaries are a record of just how depressed and how much trouble I was having." Blanch found Folbigg's answer "simply unbelievable." The only reasonable interpretation of the diaries, he concluded, was as "virtual admissions of guilt."

Folbigg would remain in prison.

When Vinuesa heard that the inquiry report had come out, she couldn't bear to read it right away. She waited until the end of the day, when she left her office, bought a coffee, and sought out a sofa in a secluded corner of the university's medical school. She opened the inquiry's 500-page report and scrolled to the section with Blanch's decision. She read it, then went home. She couldn't believe it. In the middle of the night, she woke up weeping. She thought about Folbigg: If this woman was in fact innocent, her suffering must be beyond comprehension. Although they lived worlds apart, there was something in Folbigg's story that Vinuesa understood, intensely. Indeed, when she read the diaries, Vinuesa saw a former self.

When Vinuesa's first daughter was an infant, she was

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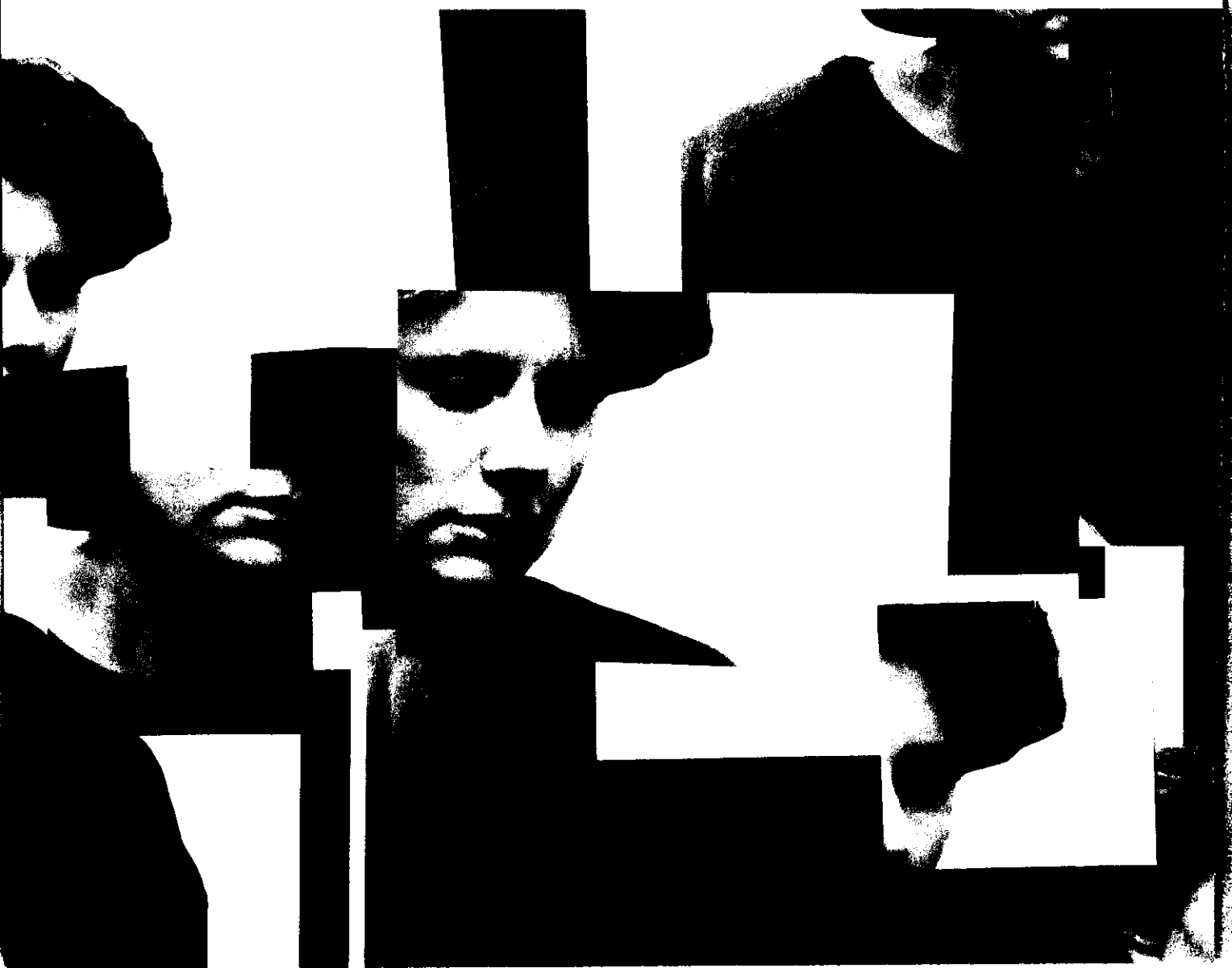
often up all night screaming. Vinuesa remembered taking her to a pediatrician, who said, glibly, "a colicky baby means a nervous mother." The following year, when her second daughter was born, Vinuesa found it nearly impossible to find enough time to work. She had to find a way to pay for childcare.

Vinuesa had just discovered a variant in mice that led to an auto-immune disease; her career was taking off. If she neglected her research now, she feared, her male colleagues would continue publishing and she'd be left behind. She frantically applied for grants and prizes to try to secure funds. That year, she won the Prime Minister's Prize for Science, and with it a $50,000 award. She used much of it to pay a nanny. She and her husband soon divorced. In those early years, Vinuesa often felt alone and miserable—and sometimes resentful of her position as mother. "I loved my babies," Vinuesa told me. "But I was constantly dealing with feelings of exasperation and guilt."

The memory of those feelings had stuck with her. When she read Folbigg's diaries, she didn't see ciphers of a criminal mind. She saw another woman grappling with the occasional despair of motherhood. This, she knew on some level, was why for the past year she had spent almost all her free time thinking about Folbigg.

But there was something else. Vinuesa had that obsessive streak. It was what made her such a talented researcher. When analyzing a genome, she would always look a bit longer than anyone else. She went deeper into the scientific literature. She manually filtered data instead of relying on an algorithm. Her intense focus was what led her to discover the variant in the Macedonian family when others had given up on the mystery. She had built a career on scientific perseverance, sometimes at the expense of her personal life. "I'm very hardworking," she told me. "Sometimes too much."

The Folbigg case had distracted Vinuesa, who had celebrated her 50th birthday just before the end of the



inquiry, from her other research projects and from her family. Every night after work she was responding to some email from Folbigg's legal team or reading papers on the calmodulin genes. Her relationship with her new partner grew strained. The two eventually separated. "My mind was somewhere else," she said. "He didn't feel very appreciated." To have a judge and lawyers then doubt her work was a blow to her pride. Now, because of this decision, she was supposed to simply let it all go. It all felt deeply unjust. To Folbigg, yes. But also to Vinuesa.

She kept returning to one line from Blanch's decision: "I prefer the evidence ..." What did it mean that Blanch *preferred* the expertise of the Sydney team? That their evidence was more compelling or that it supported the judge's desired conclusion?

True to form, Vinuesa kept digging. She enlisted a biochemist in Denmark to run tests on the mutation in a synthetic cell, a method she knew to be highly predictive of what happens in a real cell. He came back with unambiguous results: Under lab conditions, the CALM2 mutation was as lethal as other calmodulin mutations that had caused sudden death early in life. Vinuesa sent the results to several experts, including the clinician who had performed cardiac tests on Folbigg during the inquiry. After reviewing the findings, they all agreed to put their names on a research paper that Vinuesa then submitted to *Europace*, the official journal of the European Society of Cardiology. In November 2020, their paper was published. Folbigg's legal team lodged an appeal to the Supreme Court of New South Wales to challenge the findings of the inquiry.

The judges upheld Blanch's decision.

There was only one option left: to petition the governor of New South Wales to enact the Royal Prerogative of Mercy. In other words, to grant Folbigg a pardon. In March, Folbigg's legal team drafted the petition and sent it to eminent scientists around the world to sign. So far, they have collected more than 100 signatures, including from several of the world's leading cardiac geneticists and two Nobel laureates.

The petition—like the appeals that came before it—argues that the new evidence on the CALM2 variant raises reasonable doubt about Folbigg killing all four of her children. To keep Folbigg in prison would be to establish a dangerous precedent, "as it means that cogent medical and scientific evidence can simply be ignored in preference to subjective interpretations of circumstantial evidence."

AFTER AN ATTACK BY AN INMATE, FOLBIGG SPENT MOST OF HER TIME IN A PRISONER PROTECTION WING.

Getty Images (Folbigg)

The petition awaits review in the office of the New South Wales attorney general, Mark Speakman. Vinuesa and many of her peers insist the science is clear—CALM2 is now in the medical literature as a genetic cause of SIDS. The investigation of Folbigg's DNA had helped to advance scientific knowledge. But Folbigg's own fate remains uncertain.

In June of this year, Vinuesa traveled from Canberra to the Clarence Correctional Center in Grafton, New South Wales, a new high-security prison where Folbigg had been transferred, to meet her in person for the first time. After an attack by an inmate, Folbigg was spending most of her time in the prisoner protection wing. ("No real damage done," she wrote to a friend. "Purple eye, few bruises, all because the women didn't want 'likes of me' in their unit.")

Vinuesa passed through several security checks and was ushered into a cavernous room. Two guards walked Folbigg in. Her hair, once a vibrant red, had turned gray, and her loose curls were cut to just above her shoulders. The two women, wearing face masks, sat across from each other, smiling at each other with their eyes.

They talked about the inquiry and their disappointment, and the suspense of the petition. Folbigg said she was pleased that the petition—her last shot at freedom—had gathered support from so many renowned scientists. But she wasn't getting her hopes up. No matter what, she told Vinuesa, she planned on studying to become a counselor, to help women deal with grief after the loss of an infant. Vinuesa was struck by Folbigg's equanimity. "If this happened to me," Vinuesa thought, "I'd hate the whole world."

Vinuesa couldn't help but feel she had let Folbigg down. In a few months, she was planning to leave Australia for a new job at a research institute in the UK. She intended to stay in touch with Folbigg's legal team, if need be, but she also looked forward to a fresh start.

Vinuesa told Folbigg she had hoped to say goodbye on a happier note. Folbigg told her that the petition alone had improved her life in prison. After it became public, she said, she received a letter from some other inmates telling her she was now welcome to join them in the main section of the prison. They believed her to be innocent.