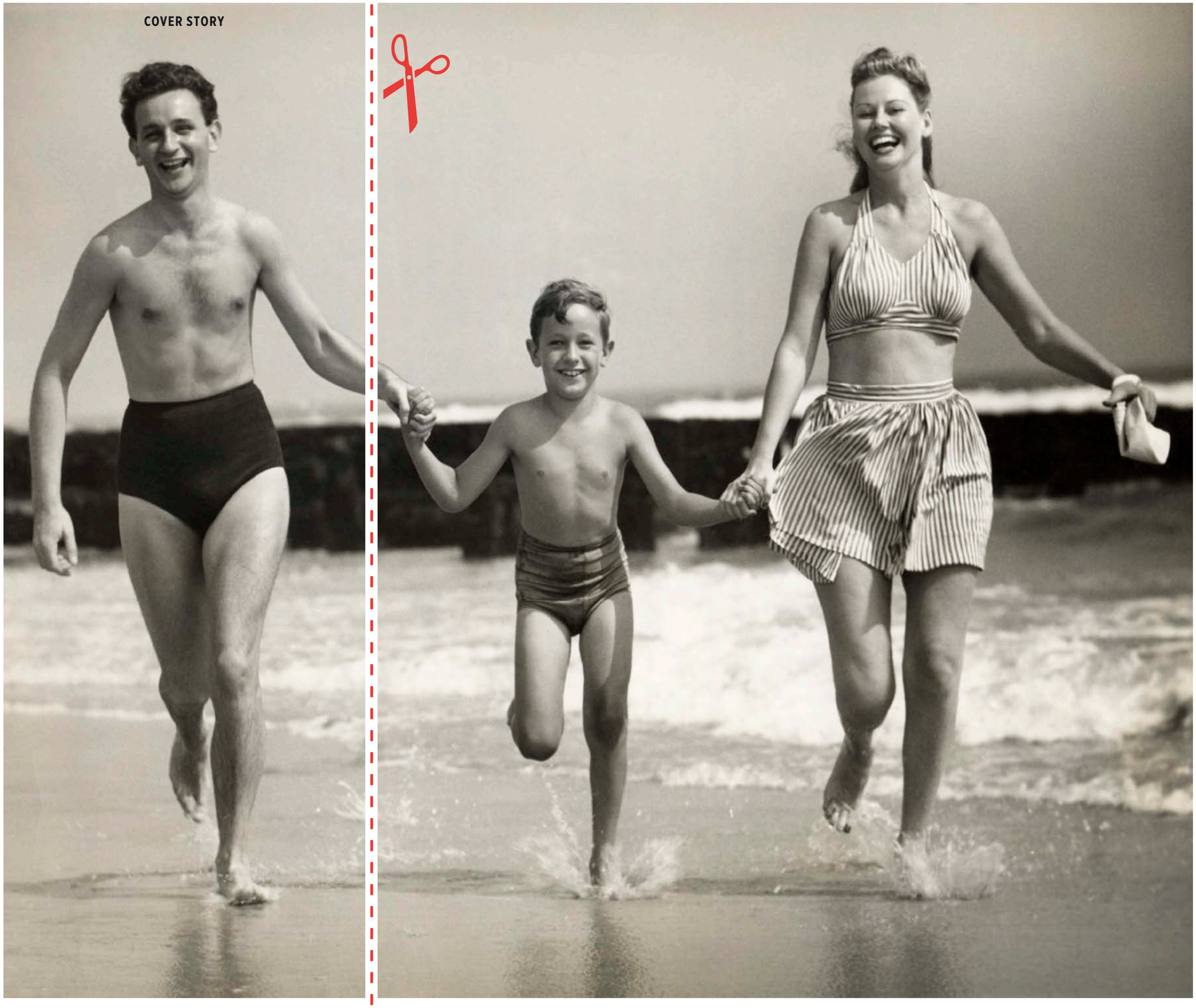


GETTY

WHO'S YOUR DADDY?

An explosion in the popularity of DNA tests is exposing a litany of secrets and lies, with as many as one in four tests returning an unexpected result. And as Joanna Wane discovers, it's ripping some families apart.

How many people would have known what the hell a "centimorgan" was? Jenny Rhodes* did. And when she saw the numbers on her computer screen, she also knew they didn't stack up.

"I was sitting there thinking, 'This is a bit weird,'" says Rhodes, a genealogy sleuth who'd spat some saliva into a test tube and sent it off for an ancestry DNA test to help flesh out her family tree. The analysis showed solid Anglo-Saxon stock – no surprises there. But when her DNA was matched with other genetic profiles on the company's database, a woman she'd never heard of popped up as a first cousin or half-niece. Her connection with a few relatives on her father's side also looked out of whack.

At first, she pushed the mystery aside. Both her parents had recently died and Rhodes was deep in her own

Joanna Wane is *North & South*'s deputy editor.

** names changed for privacy reasons*

battle with cancer. But the truth was she already understood what it meant. A few months later, she gathered herself together and confided in her eldest brother, who had his DNA tested, too.

For a layperson, the science is quite complex, but essentially centimorgans are units used to measure genetic links; full siblings share around 3500 of them. Rhodes and her brother fell short by half. "It had always been a family joke that one of the boys had been fathered by someone else, because he was a little different to the rest of us," she says. "Nobody ever dreamt it was me."

Rhodes, who's in her 60s and lives in a small rural town, is still coming to terms with the fact that the "lovely, gentle man" she was raised and nurtured by is not her biological father. What makes her DNA such a tangled mess is that the person who contributed nothing to her life but his sperm was one of her father's close relatives. Of the four siblings, the eldest is their parents' natural child, while Rhodes and at least one of her brothers were conceived during what appears to have been a long-running affair between their mother and the man we'll call Lou*. Another brother is yet to be tested.

Like a Tom Thumb firecracker, the revelations have set off a chain reaction that's sent a series of explosions rippling across provincial New Zealand. Lou died years ago, but is still well known in the town where he was a respected member of the community and raised a large family of his own; some still live locally.

One of Lou's sons agreed to a DNA test, which confirmed the liaison took place, but he has sworn Rhodes to secrecy to protect the family's reputation. Most of his siblings still don't know she's their half sister. And Lou, it seems, was a bit of a player: another illegitimate daughter has been discovered living in Australia after her grandson, whose DNA profile is also on the database, was tagged as a genetic match.

For Rhodes, one of the toughest moments was breaking the news to her adult children, who had a close relationship with their grandfather. "God, it was awful. They doted on him," she says. "Threaded through all this is an absolute feeling of such sorrow for my dad. I would love to have his DNA, because he was such an awesome person. And oh my god, did he know? That's a huge issue for me. But I don't have the answers because there's no one to ask. The key parties are dead."

There's hurt and anger. Regret for the conversations she never had the chance to have. But it's also helped make some sense of the difficult relationship Rhodes had with her mother, who was years younger than Lou and from a conservative, middle-class family.

"[Prime Minister] Jacinda Ardern can stand there meeting the Queen, pregnant, with her lover at her side. But in the 1950s, there was no DPB and divorce was absolutely frowned upon; it cost an arm and a leg, and there was all that humiliation of your name being published in the *Truth*," she says. "And what was it – just a bit on the side? There was definitely a discrepancy in power. I never understood why my mother behaved the way she did towards me, but I do now. I must have been a constant reminder to her."

For the grandchildren, discovering their "prim and proper" grandmother led a secret double life came as a shock. But Rhodes' oldest son says he has little interest in Lou, other than any genetic health conditions that might have been passed down the line. As far as he's concerned, DNA tells only part of the story. "That sense of belonging – of community or whakapapa – is actually more important," he says. "Grandpa is still the grandpa we grew up with. It sounds like we got the better one, anyway. But the estimation of our grandmother has gone down the gurgler."

Rhodes didn't go looking for scandal, stumbling across it by chance. Yet there's a sense she's somehow at fault for causing a rupture in the family. One of her brothers initially struggled to cope and appeared to blame her for tainting his mother's memory. "It's certainly upset the family dynamics," she says. "It's almost like I have opened a door and let a snake in."

THERE'S A GENEALOGICAL term for the way Rhodes' world was upended through a spit of saliva. It's called a "non-paternity event" or NPE, a bloodless phrase for something so irrevocably life-altering.

In the US, a support and advocacy group for people blindsided by a genetic test has come up with its own definition: "not parent expected", to encompass cases where someone didn't know they were adopted or conceived using a donor egg. Most stray DNA is paternal, but modern technology means it's possible even the woman who gave birth to you may not be your mother by blood.

Genealogist Gail Wilson-Waring.

"For most people, it comes as a complete shock. And it's breaking families apart."

"It's getting harder and harder to keep secrets in our society," US genetic genealogist CeCe Moore, who consults on the TV show *Finding Your Roots*, told the *Atlantic* last year. "If people haven't come to that realisation, they probably should."

Estimates of misattributed paternity range wildly, but in 2005 a New Zealand Law Commission report settled on a conservative rate of 1.8%. That might not sound like much, but it equates to about 80,000 people – nearly the entire population of Palmerston North. Genealogy researchers put the number much higher. Some surveys have found that between 5% and 10% of people who take a DNA test discover their father isn't who they thought he was, in circumstances that encompass infidelity, undisclosed adoptions, rape and even babies being switched at birth.

The numbers are so alarming that the UK's fertility regulator, the Human Fertilisation and Embryology Authority, has called on DNA-testing websites to warn people of the risk of uncovering traumatic family secrets, with anecdotal evidence suggesting two-thirds of people whose parents had fertility treatment have no idea they were donor-conceived. In New Zealand, donors had the right to remain anonymous until a law change in 2005, and parents still have no legal duty to tell children about their biological roots.

A lack of reliable figures makes it difficult to separate fact from urban myth. In the UK, one rumour was that a hospital programme testing for inherited diseases was halted in the 1980s because the results showed one in six children was not the offspring of their mother's partner at the time. Here, there's an unconfirmed story doing the rounds that plans to genetically map an entire small town were abandoned 20 or 30 years ago because initial tests showed so many people weren't biologically related to the man they considered their father.

DNA profiling for medical purposes is becoming an increasingly valuable tool – to look for genetic mutations associated with an increased risk of cancer, for example – and personalised medicine is seen as the way of the future. In Iceland, a biopharmaceutical company has sequenced more than half of the country's adult population to identify genes associated with diseases. In England and Scotland, the National Health Service carries out about 220,000 genetic screening tests each year for preventative action against diseases such as cancer. Ian Cumming, who heads the NHS training body, has estimated one in 10 of those tests reveals people are mistaken about the identity of their fathers, leaving the medical profession facing an ethical quandary. He predicts that within a decade, genome testing will be available to anyone who wants it, with the cost of a full DNA profile expected to fall below $US200 within the next couple of years.

Where the numbers have already exploded, though, is through the commercialisation of ancestry testing via direct-to-consumer kits. An estimated 30 million have been sold worldwide, with about 150,000 of them finding their way to New Zealand. Marketed as a window to the past, an ancestry analysis provides a breakdown of your ethnic origins by testing autosomal DNA, from both the male and female line. Serious genealogists dismiss it as little more than a party trick, and the science is patchy so far, but last year, US company AncestryDNA sold 1.5 million kits in a single weekend during a flash sale.

While ancestry testing can throw some curve balls (there have been cases of labs being duped by samples of dog DNA), most big surprises come from the genetic matches provided as part of the service, identifying likely relatives among other profiles already stored on the company's database.

GETTY

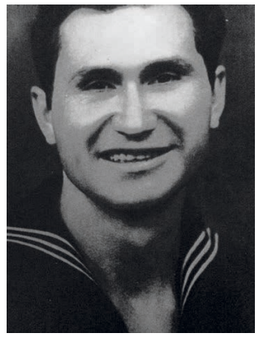
"It's getting harder and harder to keep secrets in our society. If people haven't come to that realisation, they probably should."

US GENETIC GENEALOGIST CECE MOORE

Genetic matching is a handy tool for genealogists who've hit a brick wall in their research, and there are plenty of stories with happy endings where people have made rewarding connections. But while some links might be traced to a shared ancestor many generations back, others strike much closer to home – dropping a bombshell that completely redraws the family tree.

In the US, where millions of people have had their DNA analysed, surveys suggest as many as one in four tests generates an unexpected result, says Auckland genealogist Gail Wilson-Waring, who's also a researcher on local TV show *Lost and Found*. "Not necessarily an NPE, but a close family member or first cousin they knew nothing about," she explains. "I know from the ones I've worked on, it's pretty high. For most people, it comes as a complete shock. And it's breaking families apart."

In one recent case, a woman told her she'd been cut off by her father, who is now planning to change his will after discovering she's not his biological daughter. Her mother is dead and the rest of the family have sided with their



Above: Catherine St Clair's parents on their wedding day. St Clair (above centre) was in her 50s when she discovered she has no genetic link to her father (above right). Below left: David Lomas of the TV show *Lost and Found* breaks some bad news to a woman whose search for her biological father led her to Minneapolis. Below right: Debbie Shute and her biological father Ray Twist.

dad. "She is devastated, and there is no-one she can talk to about it."

Wilson-Waring was an early adopter of genetic testing: her mother was illegitimate but refused to discuss it, and she couldn't talk to her grandmother about it because she had dementia. It was only at her mother's funeral that a great-aunt fingered the prime suspect, who was later confirmed as her mother's biological father via DNA. She says countries such as Australia and New Zealand that were settled by immigrants have snapped up ancestry kits, while uptake in the UK is comparatively low. "I think they like to keep their dirty laundry hidden."

Now, genetic databases are growing so fast they're reaching a tipping point, says Wilson-Waring, who predicts a "huge balloon" of cases in the next year will see skeletons come tumbling out of the closet. "In the last series, we had a number of applications from people who'd say, 'I've recently done a DNA test for ethnicity and found out my dad isn't my dad.' Three years ago, we didn't have any," she says.

"Some people will be fascinated their boring family is more exciting than they thought it was. Others will be horrified. When a child is born, I think they have every right to know where they come from, but often Mum has passed away or she won't tell them anything. A lot of women take their secret to the grave."

CATHERINE ST CLAIR, a music therapist who lives in Texas, was in her 50s when she was given a DNA test kit as a birthday present from her siblings – and discovered she had a different dad. By the time she traced her biological father, he had died. On the plus side, she's found a couple of half sisters.

Two years ago, St Clair founded DNA NPE Friends, the US initiative mentioned earlier. Its closed Facebook group now has 6000 members from as far afield as Australia and New Zealand, and a non-profit fellowship has been established, providing grants to pay for DNA tests or help cover travel costs. It's not unheard of for someone to finally track down a biological parent half a world away, only to be told they're on their deathbed and to get on a plane without delay.

US-based spokesperson Rebekah Drumsta isn't an NPE herself, but her aunt is. One of her uncles has also discovered a son he didn't know existed. It's a phenomenon that cuts across religion, social status and race, she says, and for every unexpected DNA test result, between 50 and 100 lives are affected.

"Some of the stories are crazy," she says. "We've had kidnapped, we've had switched at birth. We've had rape and incest. Maybe there was sex before marriage in a religious environment where that's not supposed to happen. In the wild 60s, someone might have had multiple partners in a week and have no idea which one [the father] was. Or suddenly black people show up in a family tree, tracking back three generations to a plantation in the South. So people with racial biases are being challenged, too."

The "loss" of a biological parent can trigger an identity crisis psychologists now recognise as a form of trauma, says Drumsta. She's seen relationships fall apart under the strain. Many NPEs become estranged from their families, and she's heard of mothers threatening to disown their children rather than admit they had an affair.

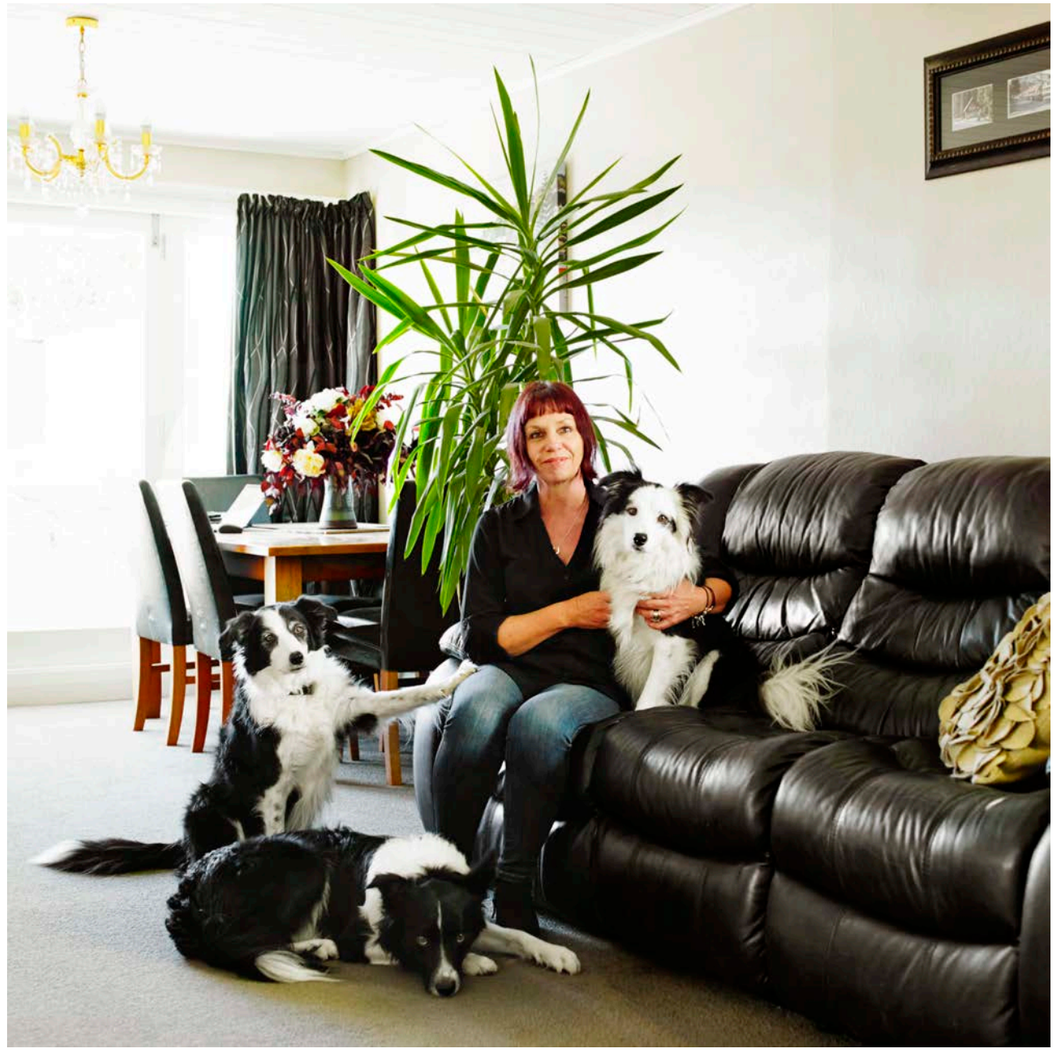
"This is a tsunami hitting the world," she says. "People are having to face the decisions they made and see the effect of those choices carrying down from generation to generation. Whether it was something done to the mother, or something she chose, what our community feels is that what's flowing through my veins is part of who I am. It's my story and I have a right to know."

David Lomas, who produces and presents *Lost and Found*, has reunited dozens of family members separated by time or circumstance. He calls applicants to the show "seekers" and, like Drumsta, believes they have a right to any information he finds on their biological parents and siblings, whether or not he's able to broker a meeting. "It's a terrible thing to have, that always wanting to know. You feel it in the gut," he says. "And even with DNA, you've still got a lot of solving to do. It's not just who the person is, but why."

What Lomas tells them is this: we might give you answers, but we won't necessarily give you happiness.

Over the years, he's uncovered horrific cases involving sexual assault and incest, alongside affairs and one-night stands. "People come with idealistic hopes that they were conceived in love. The truth is sometimes it might have been lust, or abuse. But at least they've got an answer and they never have to wonder again. They might not get a fairytale, but they don't have to go to the grave thinking there was a fairytale out there they never found."

For Wellington property manager Debbie Shute, who appeared on the show's first season, it wasn't a DNA test that flipped her world upside down but a phone call from her sister. Isn't it crazy,



VICTORIA BIRKINSHAW

Property manager and dog agility trainer Debbie Shute at home in Wellington with her border collies. Finding her birth father (pictured opposite) has been transformational for both of them. "I've really found myself. I know where I belong now."

she said, that Dad isn't your real father?

Shute, who was 47 and married with a teenage son, had no idea what she was talking about. "Mum had passed away two years before, and Dad assumed she'd told me before she died. He and my sister thought I knew but hadn't said anything, which they were a little upset about."

It turned out Shute was a baby when her mother married the man who raised her as his own. The couple went on to have two more children and although Shute never felt treated differently, she remembers a nagging feeling that she looked a bit different and somehow didn't quite fit in. When she approached *Lost and Found* with her story, all she knew about her biological father was his surname and that he lived somewhere down south. "Dad told me everything he knew about him, which wasn't a lot," she says. "He thought I had a right to know. I take my hat off to him; he did an amazing job and I'm very thankful he took Mum and me in. And without him, I would never have met Ray."

A retired butcher, Ray Twist lives near Christchurch with his wife, Carroll. The couple have three sons, and Carroll knew Ray had fathered a daughter he'd never met – the little girl in a tattered photo he had kept for more than 40 years. Their first meeting, captured on camera, is sweet and slightly awkward. The physical resemblance is obvious immediately.

Five years on, they've slotted easily into each other's lives, staying in regular contact and taking campervan trips together. In October, Ray and Carroll will be in Cromwell to watch Shute compete with her border collies in the New Zealand Dog Agility Championships. Sometimes it still feels surreal, she says. "I would have liked Mum to be here, to ask her why she didn't tell me. For a long time, I was disappointed and angry. Everyone else seemed to know! Since then, I've put a lot of things together and can understand it, as well. It was a different time; she was very young and it must have been hard on her.

"There's a bit of guilt there for Ray. It wasn't a serious relationship and he shot off overseas. Having a baby wasn't what he wanted or expected at the time. But I heard him on the phone the other day and he said, 'I've got to go, my daughter's here.' He's so proud it melts my heart. It's curious but in the last few years I've really found myself. I know where I belong now."

Above: Waikato University senior law lecturer Dr Andelka Phillips advises people to read the fine print before ordering a genetic test online. Below: AncestryDNA's Brad Argent.

THE FLIPSIDE of a rogue DNA test, of course, is it can also deliver the devastating news to a father that he has no blood ties to his children. In the US and the UK, that's led to a wave of "paternity fraud" cases, where men have sued for damages after being hoodwinked into raising or financially supporting someone else's child. In 2017, a Liverpool woman was sent to jail for 12 months after admitting she faked a paternity test.

Auckland legal researcher Zoë Lawton, who has investigated issues around deceitful and misattributed paternity, says men able to prove they're not the biological father can apply to the IRD for a refund of child support. However no figures are kept on how often that has happened. In the UK and Australia, men have brought claims under the tort of deceit for emotional distress and the cost of raising the child. Lawton would be interested to see a test case argued here to see whether we follow the UK, where claims have been allowed, or Australia, which has been far more conservative. In New Zealand, there is no legal obligation for anyone to submit to a paternity test, and a court cannot order a child to be tested, although a finding can be made based on other evidence, as happened in the case of former Auckland mayor John Banks (see *Written in the Genes*, page 40).

Lawton is writing a book on famous or landmark cases to do with sex, IVF and contraception. One involves a New Zealand man who claimed he was tricked into fathering a child and wanted out of child support obligations (the court's decision went against him). In another case, in Canada, a man was found guilty of sexual assault after he swapped his partner's birth control for a placebo.

Sometimes the truth comes out when a relationship breaks down and the mother tells her partner he's not the biological father because she wants full custody, she says. "Some men feel really angry and don't want anything to do with the mother or child. Others don't care there's no biological relationship and say, 'I love this child and I want to stay in their life.' It's so complex.

"Sometimes a non-biological father knows the truth from the outset, thinking they're doing the right thing for the benefit of the child to minimise the hurt. But people aren't good at keeping secrets. Eventually someone spills the beans."

Lawton says sometimes the secret is weighing on their mind, and they feel an obligation to let their son or daughter know. Others find out when their biological father dies. "He feels guilty for not being in their life, leaves a note saying, 'Surprise!' and a slice of his estate, which comes as a shock to the rest of the family.

"Sometimes the child gets an inkling as they get older, especially a teenager who feels disconnected from their father or that they're the oddball in the family, and starts digging around. DNA is just another way for them to find out."

Key players such as AncestryDNA and 23andMe have dedicated staff to handle "more sensitive queries", yet the reality is their customers are often home alone when they click on their test results. Rebekah Drumsta thinks there should be compulsory warnings on DNA test kits about the potential harm of unexpected results, in the same way there are cancer warnings on cigarette packs.

AncestryDNA's international spokesperson Brad Argent, who gave a public talk in Auckland in June, recommends anyone considering an ancestry test should talk with their parents first, to give them an opportunity to disclose any family secrets. In his experience, most people whose results show an anomaly already had suspicions something was up. "We do our best to inform people of the risks."

Also problematic is that DNA matching means even people not on the database risk automatically losing their genetic anonymity – an issue raised in a recent blog by the Privacy Commissioner.

Last year, the commissioner was contacted by a man whose sister took an ancestry test, and discovered a close relative no one in the family knew about. The person turned out to have been conceived using sperm the man had donated in the 1980s, after being reassured he would be anonymous and untraceable. He complained that the DNA-testing company had not sought his consent in disclosing the existence of this person to his sister. However, in this case the Privacy Act (which regulates how agencies collect, use, disclose and store personal information) did not apply, because it was not the actions of the company but of the man's sister and his biological child that resulted in the information being revealed, because they had uploaded their DNA.

Dr Andelka Phillips, a senior law lecturer at Waikato University and a research associate at Oxford University, has privacy concerns around DNA testing, including the capacity of a legal guardian to give consent on a child's behalf, "particularly because you don't know necessarily how long the data is going to be stored or who it's going to be shared with".

Phillips also recommends discussing testing with your family, not just in case there are secrets, but because so much of our DNA is shared. Ancestry results, she notes, should be treated with caution. "The tests are not standardised, so you can get contradictory results from different companies. Even the largest databases don't have large samples from all populations, and indigenous peoples and other minorities are often under-represented."

In most cases, she says, companies aren't making a profit from the sale of the test kits themselves but by accumulating large databases that can be used in commercial partnerships. AncestryDNA recently teamed up with Spotify to create curated playlists inspired by a person's ancestral origins, while 23andMe is collaborating with Airbnb to provide genetically tailored travel experiences. The latter has partnered with at least 15 pharmaceutical companies; last year GlaxoSmithKline announced it was investing $US300 million into 23andMe to use aggregate customer data for drug research.

Read the fine print before ordering a genetic test online, advises Phillips. Her book *Buying your Self on the Internet: Wrap Contracts and Personal Genomics* has just been published by Edinburgh University Press. It looks at the rise of the genetic-testing industry, and the legal and ethical issues involved. She'd like to see specific regulation of the industry and far more transparency in DNA-testing contracts and privacy policies, particularly over consent for data to be used for research or shared with third parties, such as drug companies and law-enforcement agencies (see *Framed by DNA*, page 38).

"First rule of data: once you hand it over, you lose control of it," University of California law professor Elizabeth Joh warned recently on Twitter. "You have no idea how the terms of service will change for your 'recreational' DNA."

THE DEBATE OVER whether the true essence of who we are is shaped by nature or nurture tipped to the biological camp this year with the publication of

KEN DOWNIE

Auckland legal researcher Zoë Lawton has investigated issues around deceitful and misattributed paternity. "People aren't good at keeping secrets," she says. "Eventually someone spills the beans."

“A blood tie is less important than whether people feel they’re part of the family, or feel a connection with a father figure, whether biological or not.”

PROFESSOR QUENTIN ATKINSON

FRAMED BY DNA

Should police have access to genealogy databases – and do the innocent have anything to fear?

US psychologist Robert Plomin’s book *Blueprint*. Known in academic circles for his longitudinal studies of twins and adopted children, he says the latest science shows genetics heavily influences everything from personality and verbal ability to traits such as kindness and grit.

However Professor Quentin Atkinson, an evolutionary anthropologist at Auckland University, says the human species can create strong kinship connections even where there is no genetic link.

“There’s not a kind of magic dust that gets sprinkled over parent and offspring so they fall in love with one another. There are actual psychological mechanisms involved that create real bonds between a parent and child, and which can still work when there’s no genetic link,” he says. “A blood tie is less important than whether people feel they’re part of the family, or feel a connection with a father figure, whether biological or not. It can be just as meaningful.”

Jenny Rhodes won’t be changing her father’s name on her birth certificate. There’s a difference between shared genes and a shared heart, she says. And although things would be simpler if she hadn’t taken the DNA test, “I’m glad I did, because it affects life going forward from here. It affects my kids, it affects my grandchildren. Medical stuff is important and I don’t have the answers for half of my family.

“But Lou wasn’t a father to me. He didn’t have anything to do with bringing me up, with nurturing me. He didn’t contribute anything but sperm. That’s what I have to remind myself.”

NO WONDER DETECTIVES thought they had their man in a 2012 murder case in the United States that could have put 26-year-old Lukis Anderson on death row; his DNA was found on the victim’s fingernails. Even Anderson, a homeless alcoholic, thought he might have done it. Only some digging by a conscientious public defender showed he was actually in hospital across town, detoxing, when the killing took place.

It took months to work out what had happened. The two ambulance officers who picked a near-comatose Anderson off the street were the same paramedics later called to the murder scene, and had inadvertently transferred traces of Anderson’s DNA to the body.

Auckland private investigator Tim McKinnel, who helped overturn Teina Pora’s wrongful conviction for murder, says DNA has been a game changer for both the prosecution and the defence. But he warns we should tread with caution: people continually shed DNA wherever they go, and evidence based on “touch” (or low copy number) DNA comes with substantial risks. “We need to be careful we don’t create an environment where each of us must maintain a diary or record of where we have been and why, in case we are one day required to account for the presence of our DNA at a crime scene.”

Last year, a man dubbed the Golden State Killer was charged with a string of cold-case murders in California after investigators used the open-source genealogy website GEDMatch to compare DNA evidence with profiles stored on the database – scoring a hit when it matched a distant relative, leading them to the man now facing trial. So far, police here have ruled out accessing genealogical databases to identify possible suspects, but it’s one of a number of issues up for discussion in a Law Commission review. A final report is due to be released before the end of the year.

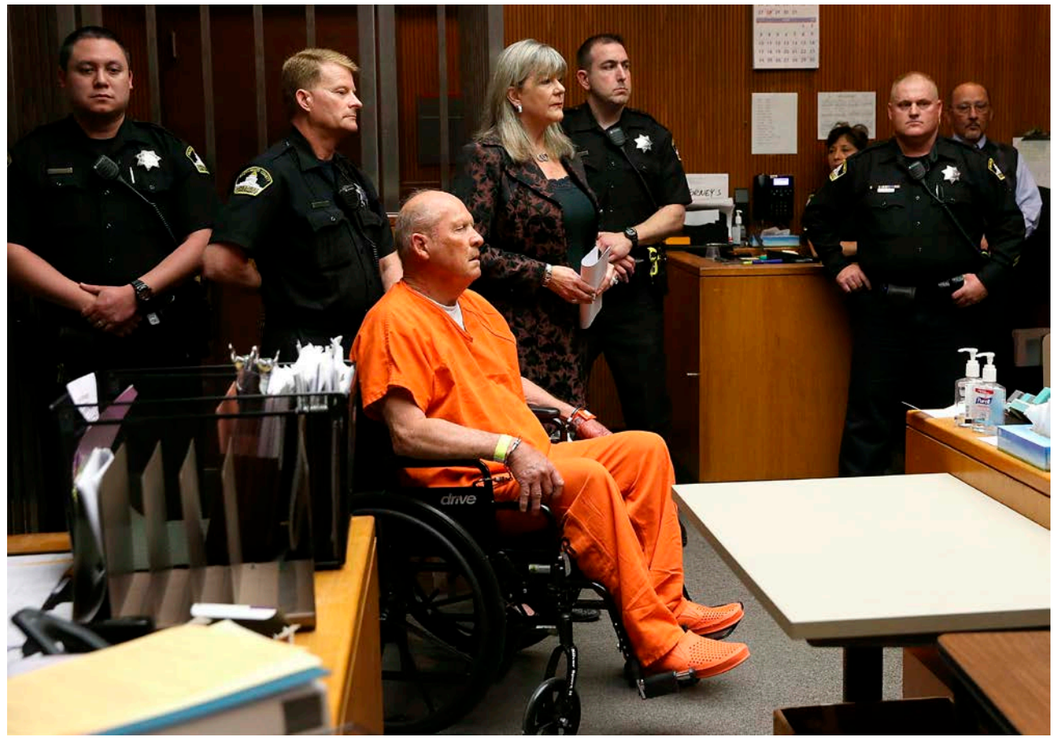
New Zealand was the second country in the world to create a legislative regime for the use of DNA in criminal investigations, but Law Commissioner Donna Buckingham says developments since it was introduced in 1995 “raise questions on which informed public debate is needed”. Currently, there are two DNA databases in New Zealand: one stores samples of unknown DNA found at crime scenes; the other holds genetic information of some 185,000 people charged with or convicted of certain crimes, or who have voluntarily supplied a sample.

Familial searches of these databases, looking for matches with unidentified DNA, are tightly restricted – although that, too, has been flagged by the Law Commission as an area for review. In California, where there are no such constraints, the strategy has led to at least another 10 high-profile arrests, including the so-called “Grim Sleeper” in Los Angeles and the “Roaming Rapist” in Sacramento. This March, DNA from the tears frozen on the face of a dead baby found abandoned in South Dakota 38 years ago was uploaded to a genealogy website; a match with relatives led to the boy’s mother being charged with murder.

The approach hasn’t been without controversy, however. Privacy concerns led to GEDMatch changing its policy in May, so people can choose whether to share their genetic information with criminal investigators rather than giving consent by default, while DNA-testing company FamilyTreeDNA now allows customers to opt out, after weathering a public backlash for working with the FBI.

Ancestry.com (the parent company of AncestryDNA) and 23andMe both say they do not engage with criminal investigations. “It’s our policy to resist any law-enforcement inquiries with all legal and practical means at our disposal,” 23andMe’s Andy Kill told the US media last year.

Waikato University’s Andelka Phillips echoes Tim McKinnel’s concerns about how personal data might be used in criminal investigations. Prosecutors in the Golden State Killer case, she notes, are calling for the death penalty. “People think, ‘It’s never going to be me,’ but the mere presence of DNA somewhere isn’t synonymous with guilt. Most of us can leave DNA traces virtually wherever we go without knowing it. It could have quite unpleasant consequences for people, and they may be innocent.”



Opposite page: A 23andMe saliva collection kit for direct-to-consumer DNA testing.

Above: The alleged “Golden State Killer”, Joseph DeAngelo Jr, makes a court appearance in California last year. The 72-year-old former police officer became the prime suspect after investigators used a genealogy website’s data to match DNA evidence from the crime scenes with one of his distant relatives.

WRITTEN IN THE GENES

Whether it's resolving a mystery or revealing a secret, DNA has become a powerful tool. Here are just a handful of cases that have made headlines in the past few years.

Top: Former cabinet minister John Banks refused to take a DNA test, but a legal declaration was made "on the balance of probabilities" that he is the biological father of Anthony Shaw, the son he'd refused to acknowledge. Above: The Archbishop of Canterbury, Justin Welby, who discovered in 2016 through genetic testing that his real father was diplomat Sir Anthony Montague Browne (right), Winston Churchill's private secretary.

• **August 2019** An Ohio couple file a lawsuit against a fertility clinic that swapped the husband's sperm for a stranger's. The man discovered he is not their daughter's biological parent after the 24-year-old gave him an ancestry kit for Christmas.

• **August 2019** A woman conceived when her mother was raped as a 13-year-old by a family friend tells the BBC she wants her birth father prosecuted using her own DNA. "I've got DNA evidence because I am DNA evidence," she says. "I'm a walking crime scene."

• **June 2019** A Canadian fertility specialist loses his medical licence for using the wrong sperm, including his own, to inseminate as many as 50 IVF patients.

• **May 2019** A 31-year-old labourer is confirmed via a DNA test as the biological heir of an English aristocrat who committed suicide in 2018, leaving behind an estate valued at £50 million.

• **February 2019** A woman in Phoenix, Arizona trying to trace her biological father takes a DNA test and finds she has a half sister, born just months apart, living in the same city; both were conceived by donor sperm from a New Zealand doctor who lived there in the early 1980s.

• **November 2018** UK millionaire Richard Mason claws back £4 million from a divorce settlement paid out to his ex-wife after a DNA test confirmed he was not the father of their three sons. Mason has been diagnosed with cystic fibrosis, a condition that leaves most men infertile.

• **April 2018** The DNA Doe Project announces it has solved its first cold case, identifying a murder victim known only as the "Buckskin Girl" after her body was found in a ditch in Ohio in 1981. Founded in 2017 by two American forensic genealogists, the project sequences DNA from unidentified bodies, then uses public database GEDMatch to look for relatives with an overlapping genetic profile.

• **September 2017** A High Court judge rules that former cabinet minister and Auckland mayor John Banks is the father of Japan-based English teacher Anthony Shaw. Banks had refused to undergo a DNA test, a fact Justice Patricia Courtney took into account when making a legal declaration "on the balance of probabilities" that Shaw was his biological son. Shaw had grown up believing his father was a Chinese man, Harry Wong, who paid child support for 15 years but wasn't involved in raising him.

• **April 2016** Archbishop of Canterbury Justin Welby discovers through genetic testing that his real father was Winston Churchill's private secretary, Sir Anthony Montague Browne. In a statement, Welby's mother says she'd slept with Sir Anthony before her marriage, "fuelled by a large amount of alcohol on both sides", but didn't realise he was the father. +