

DNA

GENETICS LAB PROVES PATERNITY, CATCHES CRIMINALS AND ENTERTAINS THE MASSES

TECHNOLOGY GOES

BY JOAN CAPUZZI GIRESI

Casino gambling offers more than amusement and the occasional jackpot. For American Indians, it can mean significant income, but only if they can prove their Native American bloodlines. DNA Diagnostics Center in Ohio will parse the eminent double helix of any person wishing to establish a genetic link to a tribe.

DNA technology is the information highway for humanity, decoding the software that identifies us as individuals, unfurling the blueprints that have designed us. By probing DNA, scientists can identify long-lost siblings, confirm grand-parent status and solve crimes. Genetic analysis even builds DNA databanks that can be used for purposes from criminal forensics to tagging disease predispositions.

"DNA technology has become a very powerful, powerful tool for us to understand ourselves," says Richard Lee, Gr'86, founder and CEO of DNA Diagnostics Center (DDC).

One of the most popular Web searches, genealogy, has translated into big business for DDC and companies like it. Curiosity seekers want to know if they are related to Thomas Jefferson or Genghis Khan, but DDC's bread and butter, about 90 percent of its casework, is paternity testing. Welfare regulations drafted in the 1980s heralded the age of paternity testing, requiring moms seeking government aid for dependent children to name possible fathers. "It's about family, and it's about child support," says Lee.

In addition to serving individuals and government agencies requesting paternity tests, DDC is contracted with most of the TV shows, like *Judge Hatchett* and *Court TV*, that pry open the fatherhood box. In the early '90s, when DDC first started working with television, the tests took about two weeks. Guests would sometimes bail out of their scheduled TV appearances. Today, the results are available in a day or two, and they're broadcast live. Talk show host Maury Povich, C'62, whose program, *The Maury Show*, contracts DDC for more than 500 paternity tests a year, sums up the effect: "We can deliver six months' worth of soap-opera conflict, drama, lust and sex in 15 minutes."

Less lusty endeavors for DDC include twin zygosity testing, which

reveals whether twins are fraternal or identical. Joint ventured with Touched by Adoption, a group that connects adopted children and parents, DDC also offers mitochondrial DNA analysis, which shows whether individuals are related through their mothers. Working with United States Citizenship and Immigration Services, DDC also runs DNA tests for immigration clients overseas.

Lee and his wife, Susannie, Gr'85, director of operations at DDC, learned to tease apart DNA while doing their Ph.D. studies in chemistry at Penn. Then they left for Cincinnati, where Susannie took a research position at Procter & Gamble and Richard started a molecular genetics lab at a major hospital. Richard became interested in applying genetic testing on a large-scale basis. He took one look at the divorce rate and its attending issues of child support, custody and visitation rights, and in 1994, became incorporated.

Chemistry professor Ponzy Lu chaired Richard's dissertation committee and oversaw Susannie's lab work. He comments on their sweeping approach to applied genetics: "A lot of people take their DNA know-how to these little biotech companies that make drugs. The Lees have taken it and gone Wal-Mart!"

DDC performs three out of every four paternity tests in the U.S. and provides testing for more than 900 affiliates in 168 countries. For some nations — Japan, to name one



WAL-MART

— DDC is the official testing lab. This year, DDC will perform some 60,000 DNA tests.

The assays are a series of tightly controlled steps that begin with a cheek swab. Using a technique called polymerase chain reaction, the DNA is amplified into many copies. Generally, 15 gene markers are evaluated. To reduce error, each test is run by two separate teams, and the results are then compared by the Ph.D.s and M.D.s on staff. Robotics are used to complete the most sensitive steps. Lu explains that this work requires “incredible attention to detail. If they make one mistake, they’re out of business.”

For a standard paternity test, which runs \$475, DDC guarantees (with at least 99.99 percent probability) that the father named is the biological father. Povich notes that while guests on his show often second-guess the results of lie-detector tests, DNA findings are almost never challenged.

One of the more exciting areas for DDC is forensics, which uses DNA to identify victims of disasters and crimes, and to finger suspects. “DNA is the biggest revolution in solving crimes since the advent of fingerprinting 100 years ago,” says Paul Ferrara, director of the Virginia Department of Forensic Science. “It serves society by helping to identify perpetrators of crimes and exonerate those who have not committed those crimes.”

While DNA has brought unmatched precision to solving crime, it has raised the bar on the

proof juries demand to convict criminals, a phenomenon popularly known as the “CSI effect.” “Juries are much more skeptical of eyewitnesses. They want cold, hard science,” Ferrara observes.

Detectives who once may have gathered a few pieces of evidence from a crime scene now collect hundreds as they follow the DNA trail. One forensic expert estimated that 10,000 additional forensic scientists will be needed during the next decade to handle the growing mounds of evidence. According to a study by the Department of Justice, at the end of 2002 (the latest available data), more than half a million cases were backlogged in forensic labs. With government labs unable to handle the workload, private labs like DDC are filling in the gaps. They analyze all manner of evidence, from chewing gum to airbags to entire cars. One of a handful of labs accredited by the American Society of Crime Laboratory Directors, DDC holds on-site police training seminars on processing crime scenes.

While DNA evidence answers many questions, explains Barry Scheck, co-director of the Innocence Project, a criminal-defense advocacy organization in New York City, it raises others. Since 1992, DNA testing has exonerated 183 convicts nationwide. “Each of these cases reveals flaws in the criminal justice system that lead to wrongful convictions,” says Scheck. A recent Supreme Court ruling will give prisoners more opportunities to



prove their innocence when scientific evidence invalidates “facts” that helped convict them.

Another boon to crime solving is the proliferation of DNA databanks, which most states maintain for convicted felons. Virginia pioneered the practice in the early '90s and claims to have drawn about 3,500 investigative leads from its database. Many human rights advocates argue that DNA data banking can lead to genetic discrimination by those who misuse the information and advanced technology. Says Penn anthropologist Janet Monge, who sometimes serves as a forensic expert witness, “The human psyche has not advanced to the same level as the technology.”

But the psyche may be the next terrain opened up by DNA technology. Scientists are fast plotting the genetic basis for ailments like heart disease, diabetes and cancer, and even diagramming the genes that influence human character and behavior. Using DNA technology, says Richard Lee, “We will one day be able to not only predict physical tendencies but also do psychoanalysis. We will probably be able to give you a pretty good map of what you are like, what makes you tick.” ■

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