Cracking the Genomics Code

Genetic research isn't just for prime-time dramas or high-profile criminal cases. Here's how African American DNA detectives are employing scientific research to change our lives.

Sonya A. Donaldson

For generations, the question of origin has been especially important to African Americans. With ancestors that were transported throughout the New World, stripped of their identities, and enslaved, there was never a way for us to answer the age-old question, "Where did I come from?" That is, until now.

Christopher Rabb, a 36-year-old writer and entrepreneur, began researching his family tree in 1994 armed with stories that had been handed down as well as documents from the national archives in Washington, D.C., that listed his ancestry as African. But Africa is a big continent, and Rabb—who also happens to be a genealogist—wanted to know which country or countries his ancestors hailed from.

"I had hit a brick wall," he says. Enter DNA testing. Popularized in the early 1990s through celebrity cases such as the O. J. Simpson trial and the ever-popular TV talk show paternity tests, the science and technology has taken quantum leaps toward helping African Americans locate a history beyond slavery. In 2003. Rabb took DNA tests for both his matrilineage and patrilineage lines through AfricanAncestry.com.

Rabb underwent two DNA tests, and then encouraged, cajoled, and persuaded family members (nine so far) to take the tests as well. Each test cost roughly \$350. Through testing, Rabb has discovered 11 ancestral lines. Ten of them go back to Africa, with ancestors from as far north as present-day Morocco to as far south as Cameroon, where he discovered his connection to the Tikar people. "I would never have guessed that I descended from eight or nine different African ancestries," he says. Rabb adds that the testing has allowed him to "embrace Africa in a more nuanced and deeper way" by driving home the reality that it is a vast land with thousands of different cultures and ethnic groups. DNA testing, for him, is like a bridge that connects histories, continents, and cultures.

No one would argue with the significance of ancestry research for African Americans in terms of recognizing and claiming a culture and history based on a particular place or places, in much the same way white Americans have been able to proudly trace and claim their European heritage. And while scientists are turning ancestry research through DNA into lucrative business opportunities, they are also involved in investigating diseases that plague African Americans at a higher rate and with greater severity such as prostate cancer, breast cancer, Type II diabetes, heart disease, and asthma.

The current and potential applications arising from this science are endless. Researchers hope that genetic research can increase life expectancy as well as improve quality of life. Several prominent African Americans are at the cutting edge of this research. Among them: Georgia Dunston, founding director of the National Human Genome Center at Howard University; Bruce Jackson, founder of the African-American DNA Roots Project; and Charles Crutchfield, a clinical dermatologist who used genetic research to develop a treatment for psoriasis. Like CSI detectives, these geneticists tackle the prevailing questions of the 21st century in their quest to help us understand and transform our lives.

Dr. Georgia M. Dunston

I am involved in the genetics of health disparities because African Americans MUST be involved in research on the human genome if our communities are to benefit optimally from the rapid growth in scientific knowledge on health and disease AND opportunities for economic growth and development.

-Georgia Dunston

Addressing Disparities

For Georgia Dunston, Ph.D., a genome research center at Howard University was not simply an item on a wish list for the venerable institution—it was a necessity. "I knew that this, of all arenas, was one in which African Americans had to be engaged. And whatever the path, I was willing to walk it," says Dunston of her determination to have the university and the African American community participate in DNA-based research.

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In 2001, the university launched the National Human Genome Center as a research site for the genetic study of diseases that are prevalent in African Americans and the African diaspora, as well as other people of color.

Dunston has been instrumental in recruiting some of the nation's top geneticists to the university and has been a force in ensuring that Howard and other historically black institutions play art instrumental role in DNA research. And she is ensuring that those HBCUs that offer doctorates in health-related sciences get the needed funds to recruit scientists, train students, and participate in research on a playing field equal to that of their mainstream counterparts.

Dunston funded the genetic research program through the Research Centers in Minority Institutions program, an entity at the National Institutes of Health created in the 1980s following legislation by Congress that addresses funding disparities. The legislation mandated that the NIH invest money to build infrastructure for research on minority campuses. To date, the Center has received about \$20 million in grants.

Why the need for a separate institution at Howard? Dunston notes that the participants in the Human Genome Project were Europeans with a traceable pedigree, yet prevailing scientific research informs us that the oldest populations—and therefore the populations with the greatest degree of genetic variations originated in Africa.

Dunston is currently researching variations within the genome. She says she is awed by the project and its implications. "Less than one-tenth of a percent of our total sequence is what we use to distinguish ourselves from each other," she says. "There are stretches in our sequence that if you looked at one portion, you wouldn't be able to distinguish us from bacteria. That speaks to the universality, the interrelatedness of all life."

Dr. Bruce Jackson

The Roots Project began as a personal effort to determine my African ancestry in the scientific field in which I was trained, molecular genetics. In my wildest dreams I did not forsee it evolving into the international project it now is.

-Bruce Jackson

The Genetic Detective

Bruce Jackson, Ph.D., might not necessarily agree with the quick move to the for-profit arena in which DNA research is heading, but the geneticist at the University of Massachusetts Lowell remains cautiously optimistic about what the research can do. At the university, Jackson investigates genes that are linked to the onset of prostate cancer—a disease that disproportionately affects African Americans. He is also cofounder of the Prostate Cancer Alliance, a national team of African American scientists searching for a cure for the disease.

Through the biotechnology program at Massachusetts Bay Community College, Jackson, who serves as department chair of science and director of the biotechnology and DNA forensics programs, created the world's first forensics DNA science degree program. Jackson is also engaged in DNA-based ancestry research, launching the African-American DNA Roots Project in 2001, partly out of curiosity about his own ancestry. He is currently working on a project to trace the black descendants of James Madison, one of America's founding fathers.

When word got out that the geneticist was using DNA to conduct ancestry research, the project was flooded with hundreds of e-mail requests a day. "When it got to 5,000 in the queue, we knew we were in trouble," says Jackson of the overwhelming response. To deal with the backlog, Jackson has directed potential participants to the Washington, D.C.-based National Geographic Genographic Project (www.nationalgeographic. com/genographic). which analyzes either Y chromosome or mitochondrial DNA and charges a nominal fee.

Jackson's approach to research incorporates not just the examination of DNA but other factors such as history, culture, food, migration, and so on. He does not see DNA as the definitive answer, but rather, as part of the answer. "There is an overreliance on the DNA data," he says. "It's a powerful tool but it was never meant to be used by itself."

Instead, Jackson incorporates other fields in order to get a clearer understanding of what the DNA is telling us. For example, he is in the process of putting together a consortium of geneticists, historians, writers, and anthropologists to move toward linking African Americans to Africans on a broad front. "There is a perception of DNA as undeniable proof, which is simply not sensible," he adds. "We are just laying the foundations for this type of research."

Dr. Charles E. Crutchfield III

I practice medicine to treat human disease. I conduct DNA research to better understand what causes it.

-Charles Crutchfield

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Going to Market

Charles E. Crutchfield III, M.D., is one scientist who decided to take his research into the marketplace. The Minnesotabased clinical dermatologist, who founded Crutchfield Dermatology in 2002 (www.crutchfielddermatology.com), conducts research to develop drug treatment for psoriasis, a chronic and often painful skin condition that affects roughly 7 million people in the U.S.

Crutchfield's research examines how psoriasis operates at the genetic level. "If you have abnormal skin and you make it turn into normal skin [through drug treatment], you're probably turning off some genes and turning on others," he says. "I can take a sample of the skin while it's healing to see which genes are being turned on and which are being turned off to get a better understanding of what is causing psoriasis." Through research and testing, "we discovered that one of the proteins that binds to DNA to cause DNA transcribing is a key factor in psoriasis research."

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Based on his studies, Crutchfield has developed a treatment called CutiCort Spray, which patients use twice a day, for two to four weeks, to treat their psoriasis. He is currently in discussions with several drugmakers to sell or license the patent and develop additional medicines to treat psoriasis.

The clinical dermatologist is in an enviable situation, because he is able to offer a research division within his medical practice with profits from the practice funding the research. Because of his unique position—specializing in skin conditions particular to persons of color, such as keloids, pseudofolliculitis barbae (razor bumps), dermatosis papulosa nigra, and vitiligo—Crutchfield is able to leverage his expertise into business success. He has spent more than \$100,000 of his own funds on DNA-based research to develop the treatment for psoriasis and is in preliminary discussions with his partners to offer patients a percentage of the profits from the research and development of biological medicine based on their participation. "Eventually [the investment] should come back to us as we sell our patent rights," he says. "I look at it as an investment in something that might have a lucrative benefit—it's a win for the patients, a win for the drug companies, and it's good for the practice."

Crutchfield received his medical degree and a master's degree in molecular biology from the Mayo Clinic Graduate School of Medicine and is currently a clinical associate professor of dermatology at the University of Minnesota Medical School.

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