



SPRING 2019

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THE UNIVERSITY OF NEW MEXICO | ALUMNI ASSOCIATION

Game Changers: Innovation and Discovery at UNM



# FASTER HORSES

EquiSeq decodes equine genetics for better health and performance

*By Leslie Linthicum*

**A**t the core of most living things is the genome, the package of genetic material stored in long molecules of DNA. It's what makes a person, a whale or a blob of algae grow and develop different characteristics. And it is at the core of developing more effective disease treatments and cures.

Scientists around the world have collaborated to map the human genome and continue to work in laboratories to tease out longer pieces of DNA and more complete genomes and to apply genomic discoveries to helping mankind.

UNM Professor Jeremy Edwards and retired biology Professor Paul Szauter pursue those ideals, but they also apply those same scientific questions and techniques to horses.

Partners in the Albuquerque-based startup EquiSeq, they have already patented

and licensed four genetic tests that will allow breeders to screen for common but devastating muscle diseases in horses.

And they have hit on a trade secret that could revolutionize thoroughbred racehorse breeding. It began with a simple question: What made Secretariat, the fastest horse in racing history, run so fast? The answer is that his heart was more than twice the size of a normal horse's heart. Bigger heart, better cardiovascular performance, faster speeds.

The EquiSeq team went looking for the gene responsible for larger equine hearts and found it. A test for that gene is just one of the performance trait tests the company plans to market.

Of all the genetic puzzles to try to unlock, why horses?

The founders knew that the human genome marketplace was crowded and

competitive. So instead of competing as one fish in a big pond, they decided to become the big fish in a small but lucrative pond.

"Nobody was working this area. It was wide open," Edwards says. "And horse owners invest a lot of money in their horse. To get a thoroughbred to age two or three, it's a couple hundred thousand dollars. And you can make millions of dollars in stud fees. So they are looking for technology to protect that investment."

EquiSeq turned to UNM Ph.D. student Alex Hafez ('14 BS) to run the company.

Hafez spends his time working out human problems — his doctoral research in the biomedical sciences focuses on trying to find a molecular basis for leukemia and lymphoma, which he hopes will have real-world implications in faster drug discoveries. His only experience with horses was taking a ride at Boy Scout camp.





# UNSPoolING DNA

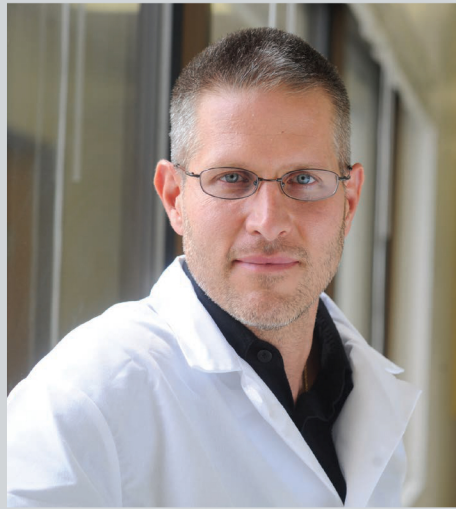
By Leslie Linthicum

But he also has an interest in business and completed his coursework for the Anderson School MBA. Through Anderson he met Szauter and got the opportunity of a lifetime — to start in business at the top, as CEO, while still a student.

Szauter, a longtime biology professor, left UNM to found the company and serves as chief scientific officer. Edwards holds the unusual title of “chief visionary oracle.”

“My role,” says Edwards, “is meeting with them and dreaming up new ideas and applications of technology.”

Their search for genes associated with other performance traits and diseases continues. 🍷



**J**eremy Edwards, professor in the departments of Chemical and Nuclear Engineering and Molecular Genetics & Microbiology and co-director of the New Mexico Spatiotemporal Modeling Center, spends most of his mental energy working on human problems.

“In general, I develop technology to improve DNA sequencing,” Edwards explains. “Trying to develop new tools and techniques to sequence DNA faster, cheaper, more accurately.”

When Edwards was just starting out as a Ph.D. candidate and postdoctoral fellow at the University of California, San Diego, and Harvard Medical School, he stayed out of the biochemistry lab and worked with a computer to develop a method to generate a massive number of genome fragments and sequence them in parallel.

The first human genome sequencing took a decade, hundreds of scientists and \$3 billion to complete.

At the time, scientists around the world were working on an ambitious project — to develop the technology to sequence a human genome more quickly and for less than \$1,000. Today, a whole human genome can be sequenced in a day for a few hundred dollars.

“It’s kind of a unique spot to be in your career,” Edwards says. “It’s unusual for your research question to be answered before you retire. I found myself in a very unique position of saying, ‘We did it.’ Not me, but we the community. I’d like to think that some of my work contributed to where we are today, not just as a country but as an entire world.”

In addition to EquiSeq, Edwards is involved in two other companies. With his assistance, Sentieon has developed the gold standard for finding gene mutations. And Centrillion licensed some technology from his lab that enables sequencing much longer pieces of DNA and more complete genomes.

Edwards is also in the final year of co-directing the National Institutes of Health-funded center for better understanding spatial temporal modeling — or how cells communicate with neighboring cells.

“In my lab I don’t do anything with horses,” Edwards says. “I’m all about applying technology to studying humans and human disease. The horse was just an offshoot. It’s a very small part of what I do, but it turns out to be exciting and fun.”

How does a mind travel so nimbly between mathematics, chemistry, biology, spatial modeling, cell signaling, engineering and even quarter horse breeding — and connect the dots in ways others haven’t?

“The short answer is I have no clue,” says Edwards. “I think differently than most people. I know that.”

Most academics narrow their focus as they move through education and research. His has broadened.

“The further I go in my career the more interested I become in other things that I don’t know anything about,” Edwards says. “So I bring a really interesting perspective to most problems, because they’re not how most traditional people in the field would see them.” 🍷

