

J. Craig Venter's Next Little Thing:

The man who mapped the human genome has a new focus: using microbes to create alternative fuels.

By Michael S. Rosenwald
Washington Post Staff Writer
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J. Craig Venter, maverick biologist, wants to cure our addiction to oil. To do so, he proposes creating a designer microbe -- the heart of a biological engine -- from scratch, then adding genes culled from the sea to turn crops such as switch grass and cornstalks into ethanol.

While he's at it, he'd like to modify or devise microorganisms to produce a steady stream of hydrogen.

Either could prompt a major shift in the economics of the energy industry and in the process bring Venter to a secondary goal: showing the world he can be as successful running a company as he was at sequencing human DNA.

"We are on a crusade as much as it is an economic goal," Venter said. "This is one of those crusades that only works if it becomes really profitable."

Five years after antagonizing government scientists while racing them to map the human genome, Venter is back, making the typically bold statements that have long polarized opinion about him. Either he is one of this era's most electrifying scientists, or he's one of the most maddening. He is apt in conversation to compare himself to Robin Hood. Or Darwin.

"Yes, Craig confronts," said Alfonso Romo Garza, a Mexican billionaire, controller of a decent chunk of the world's commercial vegetable seeds and a backer of Venter's latest undertaking. "Of course, he's antagonistic. He's controversial. But I love controversial people because those are the people who change the world."

Bearded from a three-year, Darwinesque yacht trip around the world, Venter also now sports an extensive collection of genetic material scooped from the sea on his journey -- and that's the raw material for his alternative fuel project. With \$15 million from Garza, he has launched a new company in Rockville called Synthetic Genomics Inc.

It is a small firm with classic Venter ambition. Create life. Use it to make fuel.

There are caveats, to be sure.

Venter's business career made him rich, but his record running Celera Genomics Corp. was spotty. The company's original business plan -- selling access to the genetic data Venter helped develop -- faltered because the information became public through the government's efforts.

Celera has since waxed and waned with other business plans that haven't yet worked out.

He insists this time that things have changed.

"I started Celera because I wanted to map the human genome," he said. "It's different now. We actually do have a great idea for a business."

There are a number of other companies that say they are ahead of Venter in the quest to use biotechnology to make energy, and they contend that they have more near-term and less complicated methods. Vinod Khosla, co-founder of Sun Microsystems Inc. and a prominent Silicon Valley venture capitalist who has turned his investment focus to new energy, said of Venter's new company, "There are too many technical risks cascading together."

But Venter loves the challenge. The formation of the new company solidifies ideas he has been investigating for several years through his various research foundations in Rockville. The Venter Institute and the Institute for Genomic Research have received several Energy Department grants to explore using genomics -- the study of genetic material in the chromosomes of organisms -- for energy purposes. Venter launched the new business with his longtime collaborator, Hamilton O. Smith, who won a Nobel Prize for physiology and medicine and is a noted expert in DNA manipulation techniques.

Perhaps Venter's biggest personnel coup to date was the hiring earlier this month of Aristides Patrinos, who directed the Energy Department's biological and environmental research and launched its efforts to solve energy and environmental problems using microbes. Patrinos is an influential proponent of new energy technologies and a force behind President Bush's recent focus on innovative fuel production in the State of the Union address. Patrinos, whom Venter describes as his last friend in government, led the federally funded Human Genome Project, which raced Venter to decode human DNA.

"I think it's a very significant message to the world that Ari has agreed to take on this challenge to build this enterprise," Venter said.

So far, the company has raised about \$30 million, according to Securities and Exchange Commission filings. Venter has generally avoided taking venture capital money in order to maintain tight control, something he didn't have at Celera, where he was ultimately fired.

At this point, Synthetic Genomics is a virtual company, housed at the sprawling Rockville headquarters that is home to Venter's institutes. The company is mostly using Venter's existing research staff. Venter said there could be a significant ramp-up soon,

including separate office space nearby, if development talks with major energy firms are successful. Venter said he is in discussions with several companies.

Venter is convinced that "genomics is going to do for the energy and chemical field what it did in the early 1990s for medical biotechnology."

In the case of energy, the problems are well known. Oil prices have skyrocketed. There are national security concerns over relying so heavily on foreign oil sources. Energy companies are pursuing any number of alternatives, including increasing production of ethanol.

The problem with current production methods is that they rely on using corn kernels, which are converted into sugar, fermented to produce alcohol and then distilled into ethanol. Meeting the country's energy needs using that method could eventually strain the food supply, particularly for animals that feed off corn.

Ethanol can be produced other ways, though it is more difficult. One way is to use plant matter such as switch grass, cornstalks or corn husks and break it down into cellulose using a combination of enzymes. Until energy prices skyrocketed, that option was far more expensive than using oil, and the cost of building a plant was prohibitive. More modern technology is bringing the cost down, and biotech companies are lining up to advance the technology even further. There are no commercial-scale facilities online yet, though one in Spain could open this fall.

Patrinos thinks Synthetic Genomics can reduce costs even further by using either a soup of microbes or genetically designed ones to perform, in essentially one place, all of the biological functions needed to break down the plant material and turn it into ethanol.

"Anytime you add steps, you add costs," Patrinos said. "The ideal situation would essentially just be one big vat, where in one place you just stick the raw material -- it could be switch grass -- and out the other end comes fuel that you could drive it on to the gas station."

This will not happen tomorrow. Venter's scientists will need at least several years to sift through the millions of organisms he collected on his around-the-world yacht trip, which ended last month. The hope is that something in that menagerie will provide the key to more efficient energy.

As evidence of what he thinks he can deliver, Venter pointed to DuPont Co.'s efforts to use organisms in somewhat similar ways. Scientists at the chemical company, in a project dating to 1995, have genetically modified E. coli germs in such a way that they turn corn into propanediol, a compound typically made from petrochemicals that can be used to toughen fabrics such as polyester. DuPont will open a \$100 million plant to make the material later this year.

It is also working on many other projects, from energy to hair care and skin care. "Imagine dipping your entire hand into a jar of color that only sticks to the nail surface, not the skin, not the nail bed," a company official said.

Biotech changed the way drugs are developed. For Venter and others, there is more work to be done.

"Sometimes you get a new idea that is better than the old idea," he said. "It wouldn't be the first time I've done that."

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