



CRAIG VENTER

[HUMAN GENOME SCIENTIST]

“PEOPLE WHO ARE MOTIVATED BY PURE GREED
ONLY GET THEIR MONEY WHEN THEY PRODUCE
SOMETHING THAT’S BENEFICIAL TO SOCIETY.”

Not necessarily evil:
Publicly funded science
Borrowing microbes from Bermuda
Sharing the wealth
Competition

What would it be like to know the details of your own personal programming—every A, C, T, and G as it swirls along the long, sinewy strands of your own double helix?

J. Craig Venter knows.

This millionaire geneticist, one of the chief architects of the project to sequence the human genome in the late nineties, became the first lifeform on earth to possess this intimate self-knowledge. In April, 2002, he confirmed what many had already suspected: the human genome sequenced by Venter’s former company, Celera, was largely comprised of Venter’s own DNA. An act of supreme egotism, Venter’s stunt was the equivalent of Michelangelo carving his own head onto the statue of David.

This same bravado characterized Venter’s in-their-face

approach against his rival during the bruising race to sequence the human genome. Front-page fodder from 1998 to 2000, the race pitted Venter’s feisty start-up company, which claimed it could sequence the genome faster and cheaper, against much of the leadership of molecular biology, and the fifteen-year, \$3 billion project funded by the U.S. government. The public project was led by two towering figures in genomics—James Watson, co-director of the *Double Helix* (with Francis Crick), and Francis Collins, co-discoverer of the gene for cystic fibrosis and the point man for the government project. After two years of attacks and counter-attacks in the media, during which Venter was accused of trying to privatize the human genome, the two sides declared a tie in July, 2000, under pressure from President Bill Clinton.

Since leaving Celera in early 2003, Venter—a former California surfer and Vietnam War medic—has founded the

J. Craig Venter Foundation with about \$70 million of his own money, plus grants from the Department of Energy. His primary project is to create the first-ever synthetic organism built from scratch with human-designed DNA, while also working on a project to catalogue all the genes on Earth in a global sailing expedition in his ninety-five-foot yacht, Sorcerer II, that Venter compares to the voyages of Charles Darwin.

Supremely immodest, Venter surges forth like a force of nature that can be awesome to behold. He has many admirers and has had some fantastic successes despite detractors who said he would fail. Yet he also possesses an element of danger, a sense that this ex-surfer would leap headlong into riding a Maverick's wave the size of a skyscraper whether or not he could handle it. For a man talking about creating a designer life-form, this maniacal energy makes some people nervous.

So which will it be? Will Craig Venter save us or ruin us? Or both?

—David Ewing Duncan

I. POOR LITTLE BERMUDA

THE BELIEVER: Okay, you're creating life and trying to sequence every gene on Earth. Is there anything else you're working on?

CRAIG VENTER: Other than cataloging all the genes on the planet?

BLVR: Well, that takes care of Monday and Tuesday. What about Wednesday?

CV: Oh, we're working on some secret things. Because they're really big.

BLVR: And you'd have to kill me if you told me. The genome of the universe, maybe?

CV: Who told you?

BLVR: You've taken some political heat for the Ocean Sampling project.

CV: Most of the ocean is claimed by one or more countries. There was a lot of politics building up around this thing, especially with the private/public political organ-

izations that are attacking the expedition. So we're now evil because we're putting data in the public domain. You go onto some of these Web sites, and all they say is how we're trying to patent everything. The reading comprehension for these idiots tends to be first or second grade. They are following us wherever we're going on the expedition, and they're trying to stir up political trouble for us. They tried to do that in Ecuador, and we had to go through lots of extra diplomatic channels with the State Department. We have a group that literally puts out false information.

BLVR: Before the round-the-world trip, you did ocean sampling in the Sargasso Sea, off Bermuda.

CV: We found at least 1,800 new species and 1.2 million new genes. This doubles the number of all other genes known on the planet. And this was in the Sargasso Sea alone. Wait until we release the data from the global sampling expedition.

BLVR: But isn't this just a bunch of data until you analyze it? You're talking about over a million genes, when scientists still don't know what to do with the 30,000 or so genes of the human genome.

CV: We collect the data first, then it will be analyzed. It took Darwin years to analyze his Beagle data before he understood what it meant.

BLVR: You have also had critics accusing you of wanting to commercialize the world's genome.

CV: There was a writer from *Nature* magazine who talked about how Bermuda was totally ripped off because we sequenced organisms from Bermuda waters and put the data in the public domain, and Bermuda did not share in the wealth. Poor little Bermuda, with its multibillion-dollar industry in insurance. We're taking benefit from the microbes in their water.

BLVR: Do you have any patents coming out of this?

CV: No. And that's the ultimate irony in this. We're

doing the stuff and giving it to the world, and now it's evil because countries like Bermuda want to profit somehow from this data. They just want money in their pockets. We discovered over a million genes in Bermuda waters, and the thought that they are going to get some value out of this is so absurd. It's one of these easy notions to attack modern science. I think people just like to attack what we're doing because we're always on the leading edge.

BLVR: Is it frustrating dealing with politics and with people who slow you down?

CV: Well, you make new discoveries and you have new ideas. I think the onus should be on the person who is thinking up the ideas. He has to be willing to knock heads to prove their validity. I don't think it's criticism of science and society that things move slowly. Look at all the things that are out there, from cold fusion to people trying to sell drugs. There is a lot of hype and a lot of dishonesty out there, and I don't object to the burden being put on me as a scientist at the leading edge to have to demonstrate the veracity of what we're doing.

II. THE ROBIN HOOD OF GENOMES

BLVR: You came up with your earliest big ideas when you were at the National Institutes of Health during the eighties, but you were rebuffed by [Human Genome Project director] James Watson. You then went to the private sector because they would fund you. Did you want to leave the NIH?

CV: I liked it at the NIH. I'm primarily a researcher, not a businessman. I have only gone to work in the private sector when I've had to, because sometimes they get it faster than the research community. Why do we have modern medicines? Because we have a private industry that develops them. The U.S. government doesn't develop them. I mean, it helps pay the bills, right? And that's really ironic. Our whole system is based on free enterprise, and that's how scientific discoveries get translated into people.

BLVR: Why do you think James Watson, Francis Collins, and others attacked you so vehemently?

CV: Watson and Collins spent so much time building up the genome project as the most important thing for humanity. I guess it made them look bad that a small group could do it independently, right? It went against everything they had been saying. But times change, technology changes. Competition is good for science. I think competition is good for most aspects of life.

BLVR: There was a tie declared in the race to sequence the human genome. But you've said that Celera actually won. Did they?

CV: I don't think there's any question.

BLVR: So you have Francis Collins, head of the project after Watson, and several leading scientists conducting what they considered a noble crusade, and you come along like a black prince to challenge Richard the Lion-Hearted...

CV: I see it more as Robin Hood versus the evil sheriff.

BLVR: But you were the one who set out to make money, and you did make money.

CV: I took from the rich and gave to the poor.

BLVR: You mean you took private money and produced a genome that is now free?

CV: Something like that, yes. The plan was for Celera to make money in other ways, in analyzing the data. I took my job seriously. The quid quo pro was, you know, that I had a written commitment that if I sequenced the human genome, I could publish it and release the data. The other quid quo pro was that I had to make an effort to develop a business model that had a chance for viability. So I developed the information business model. I think it was one of the earliest and most profitable biotech stories. This got totally ignored, but Celera had \$150 million a year in revenues, and the database busi-

ness was profitable. If you have something that's real, that people need and they can't get it any other way, they'll pay for it.

BLVR: You've been accused of dancing with the devil when you started Celera and went after the publicly funded Human Genome Project.

CV: I don't consider a commercial enterprise to be dancing with the devil. Some of the people involved in those enterprises were not the most upstanding individuals, and their personal motivation was just greed. But that's okay, that's how our society works. That's not a bad system. People who are motivated by pure greed only get their money when they produce something that's beneficial to society. They get their money, but society wins if there's a new treatment for cancer.

III. HIGH-RISK MOVES

BLVR: How would you analyze your own personality?

CV: Highly focused and highly innovative when I'm working on a goal I believe in.

BLVR: People say you are fiercely confident.

CV: But you can't just have blind belief. A lot of crusaders confuse wanting to win with the knowledge of how to do that. I clearly had the best scientific team ever assembled certainly in the field of biology and medicine. I look back and see 10,000 reasons why we should have failed. And I would say that 99 out of 100 teams trying what we tried would have failed. I'm able to look ahead and see outcomes of things. Everybody thinks that doing Celera was a high-risk move, but I never thought of it like that.

BLVR: Why did they think it was a high-risk move?

CV: Because the government program had billions of dollars. But money wasn't the issue. I think ideas need exposure. You bend over backwards to give the high-risk person the chance to make it work.

BLVR: Most of your ideas had to do with speeding up the process of sequencing large numbers of genes, right?

CV: I have had a team of some of the smartest people in the world. We developed these very powerful tools.

BLVR: Such as shotgun sequencing, which essentially takes DNA and smashes it and then has a computer reassemble the pieces into a more or less complete genome?

CV: But that's incredibly difficult—to get the algorithms right, to make it work. That's what we did, and they said we couldn't do it, but we did. We did it first with the *Hermophilis* genome and then the *Drosophilis*.

BLVR: *Hermophilis* being a bacterium—the first organism ever sequenced for all of its genes—and the *Drosophilis* being the fruit fly, which you sequenced next.

CV: That provided the proof that our method worked. And to Watson's credit, he applauded our *Hermophilis* results.

BLVR: Historically, how big a deal was sequencing the human genome? Was it a Copernican moment, a Galileo moment, a Watson-Crick moment?

CV: It's none of those. Our publications on the sequence of the human genome will be viewed historically as a very important moment. But it's the utilization of that information going forward that will hopefully lead to scientific breakthroughs that will be the important thing. It's a more important thing than going to the moon, or Mars, or all of these kinds of things. The techniques that were developed to do the *Hermophilis* genome and the *Drosophilis* were the scientific breakthroughs technologically. There have been very few instant cures and very few instant insights. Most scientists are overwhelmed by the data and don't use it. Yet I think of the early stages of my own career, spending ten years to find one protein

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received, she spotted a painting that had recently gone to auction. I hadn't bid on it: It was the portrait of a young man (head and shoulders), with thick lips, a slightly haughty look in his eyes, and the long, flowing hair that was so fashionable during the age in which it was painted. The painter was cited as someone from "the circle of Nicholas de Largillière," a French artist born in 1656 and who died in 1746, leaving behind more than a few paintings scattered throughout museums all over Europe. My friend's fascination with this portrait, which was clearly more than just intellectual, was so intense that in anticipation of a very important event in her life, one which most definitely deserved an important gift, I contacted Sotheby's to see if the painting was still available. Luckily it was, and after a bit of bargaining (the owner, it seemed, now wanted the painting back, but Sotheby's had secured the right to sell it for a certain period of time following the auction), I bought it and gave it to my friend. And though the young man in the painting never ages, and my friend only grows older and older as time goes by, she still lives with him, and their relationship is far more harmonious than any she has maintained with her boyfriends or semi-boyfriends of recent years.

The question of things being "virtual" is nothing new, despite the copious images of sex that have suddenly become so readily available on every kind of screen imaginable. The virtual has always existed. The strange attraction we may feel for the subject of a portrait has been the sickly, obsessive domain of countless tales of terror throughout history. Outside the realm of literature, of course, we hope and pray that one day we will find ourselves gazing at a "double," a person almost identical to the person who sat for the portrait we admire so. It isn't as impossible as it may seem: at that very same exhibition my friend and I visited at the Prado, two familiar faces, those of Spain's King Juan Carlos and Federico García Lorca, came together in one of the best portraits of the show, Goya's *The Family of Infante Don Luis*. Look for the painting, and you will see that I know what I am talking about, and you also see that there is always reason to hope. ★

translated from Spanish by Kristina Cordero

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or one gene. And now any student today can do a computer search. It's a revolution that has taken place without people realizing that a revolution has taken place. I guess it will be left up to the historians to look at because it's been so overwhelming in real time. But since it was a monumental thing to do, that happened over such a short time period, it will probably be given more importance than it should.

BLVR: How do you feel now about the commercialization of biotech?

CV: The genome success is a success of this evil private industry. It wasn't government labs developing the sequencers and the technology. That's why U.S. science is so far ahead of science in the rest of the world. We have companies like New England Biolabs that sell 5,000 different restriction enzymes and they'll give you a freezer and deliver them overnight to you. You go to Russia and you have to grow bacteria, isolate it, and purify it. So you spend six months doing that, and you can do one experiment with it. We also have industry that produces the most advanced instruments in the world so scientists like myself can do neat things with them.

BLVR: As you're creating life and sequencing the planet's genome, are you worried about any dangers?

CV: Science always has risks.

BLVR: But you are creating life. What if something goes wrong?

CV: Look, I won't tell you that there are no dangers. That's why this needs to be done out in the open with careful people making sure that mistakes won't be made.

BLVR: Is it possible that you don't know what you're doing? Can these people be right?

CV: Sure, it's possible, but people have said that before about me. And they've been wrong. ★