

The biotech Moderna delivers messenger RNA (blue) into cells to be translated into proteins by ribosomes. V. ALTOUNIAN/SCIENCE

This mysterious \$2 billion biotech is revealing the secrets behind its new drugs and vaccines

By **Kelly Servick** | Mar. 25, 2020 , 12:20 PM

***Update, 16 November, 9:10 a.m.:** Moderna announced today that its experimental mRNA vaccine for COVID-19 achieved 94.5% protective efficacy in an interim analysis of a 30,000-person trial. In 2017, Science visited Moderna to get a look at its core technology and its broad ambitions.

Our story from 1 February 2017 is below:

CAMBRIDGE, MASSACHUSETTS—In a recent morning meeting of scientific leaders at Moderna Therapeutics, conversation swerved toward the philosophical. Biochemist Melissa Moore, recently hired to head RNA research at the Boston-area biotech, had something on her mind: hype.

Specifically, she was thinking about Gartner's hype cycle, a glib model cooked up by an IT research firm, in which every new technology ascends a "peak of inflated expectations," sinks into a "trough of disillusionment," then climbs the "slope of enlightenment" to reach a "plateau of productivity." Where on this curve, she wondered to Moderna's president, Stephen Hoge, was their technology?

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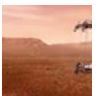
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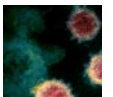
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The question is apt. Moderna was founded on the idea that messenger RNA (mRNA), the molecule that relays genetic instructions from DNA to the cell's proteinmaking machinery, could be re-engineered into a versatile set of drugs and vaccines. These strands of instructions could teach our cells to make whatever was needed to treat or prevent disease—virus-slaying antibodies, wastegobbling enzymes, heart-mending growth factors. The willingness of pharmaceutical giants and investors to bet on that premise to the tune of nearly \$2 billion has unleashed waves of both hype and skepticism.

Moderna has shared little detail in published papers about the technology it's developing, though there are clues in its abundant patent filings. Until recently, even the targets of drugs already in clinical trials weren't publicized.

But as more trials get underway, Moderna is gingerly opening up. The company agreed to *Science's* request for access to some of its researchers and labs over the past few months. And last month, at the annual J.P. Morgan Healthcare Conference in San Francisco, California, CEO Stéphane Bancel unveiled Moderna's first round of drug candidates, which include vaccines for Zika and flu, and a therapy for heart failure.

Expectations are high. Being a startup valued at more than a billion dollars—an anomaly that venture capitalists dub a unicorn—comes with scrutiny, and many wonder whether Moderna's pipeline, consisting mostly of vaccines for now, will expand to match the company's original vision of mRNA as a broad treatment platform. "There were a lot of really big promises made," says Jason Schrum, a biotechnology consultant in San Francisco and a former Moderna employee. "That's what people latched onto; they want the promises to be true, and they want to see the investment really turn it into something meaningful."

In other words, the trough of disillusionment, if it's still ahead, threatens to be deep.



Moderna's President Stephen Hoge (left), RNA research director Melissa Moore, and CEO Stéphane Bancel aim to transform messenger RNA into drugs and vaccines. © KEN RICHARDSON

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