

SPECIAL ISSUE

12.24.2021  
**New York Times Magazine**

**Elon Musk:**  
THE THOMAS  
EDISON OF THE  
DIGITAL  
AGE

AMERICA'S GREATEST  
**DISRUPTORS**

FIFTY VISIONARIES, INNOVATORS  
AND PIONEERS WHO ARE TRANSFORMING THE WORLD  
THROUGH TECHNOLOGY

## DISRUPTORS

### SYNTHETIC DNA AT COMMERCIAL SCALE



EMILY LEPROUST – CO-FOUNDER, CEO, TWIST BIOSCIENCE

**M**AKING DNA FROM SCRATCH IS TYPICALLY EXPENSIVE, PRONE TO ERROR and not easily scalable. Twist has found a way to help automate and commercialize the process by creating a technology for writing synthetic DNA onto tiny silicon chips, which can be manufactured cheaply and easily distributed to pharmaceutical companies and research labs. The technology has already had a big impact on public health: During the COVID-19 pandemic, Twist created a synthetic version of SARS-CoV-2 that was used in tests. Eventually, their synthetic DNA could also help identify specific cancers for targeted treatments and lead to ways of making spider silk at an industrial scale. This year, Twist launched Exome 2.0, a tool for bioscientists to analyze genes responsible for rare diseases and genetic disorders. —M.G.

### Medicine Delivered By Mist

MADHAVI GAVINI, RATHI SRINIVAS – CO-FOUNDERS, DROPLETTE

For people who suffer from epidermolysis bullosa, disorders that cause the skin to become fragile and blister, applying topical treatments is a painful ordeal. Madhavi Gavini and Rathi Srinivas looked for a better way to deliver medical help. Their solution: a handheld device that acts like a nebulizer and can deliver treatments and pain relievers via a superfine and powerful mist that penetrates deep into the skin. While developing the technology, with

funding from the National Institutes of Health, the two inventors decided to broaden its applicability to more common skincare concerns, such as treating wrinkles and blemishes with retinal, collagen and glycolic acid mist treatments. The pair say their device allows the skin to absorb larger molecules than are typical in topical treatments.

The approach has garnered glowing reviews in *InStyle*, *Laptop Mag* and other publications. More than 1 million of its skincare treatment capsules been sold since it launched a year ago. The pair is also working with researchers from MIT, Tufts and Walter Reed Army Institute of Research on developing the device, called Droplette, for a variety of diseases including genetic disorders, wounds and skin infections. NASA, too, has come calling, awarding them a grant to test aspects of their tech on the International Space Station. "They were fascinated by the fluid physics that drives our device," says Srinivas. —K.R.



### A Dissolvable Pacemaker

JOHN A. ROGERS – DIRECTOR, QUERREY SIMPSON INSTITUTE FOR BIOELECTRONICS, NORTHWESTERN UNIVERSITY

For patients who need temporary help regulating their heartbeat, such as those who've had open-heart surgery, a heart attack or a drug overdose, Rogers and his team created a new kind of implantable pacemaker—wireless, battery-free and, best of all, dissolvable. After five to seven weeks, the pacemaker, made of natural materials like silicone and magnesium, is absorbed by the body. Since patients don't require surgery to remove the device, they avoid the attendant risks of infection, tissue damage and blood clots. Rogers' device gets its energy wirelessly from a small device placed on the chest.

The pacemaker is the second biodegradable implant for Rogers—the first, developed in 2018, speeds the regeneration of damaged nerve tissue. Although both devices need further development and testing before they can become commercial products, Rogers is confident that biodegradable electronics have a future in medical devices to monitor and treat a range of conditions. —K.R.



CLOCKWISE FROM TOP: TWIST BIOSCIENCE; CHRIS STRONG/NORTHWESTERN UNIVERSITY; ILLUSTRATION BY ALEX FINE; SOURCE PHOTOS COURTESY OF DROPLETTE

FROM TOP: ILLUSTRATION BY BRITT SPENCER; DIJIGENT ROBOTICS