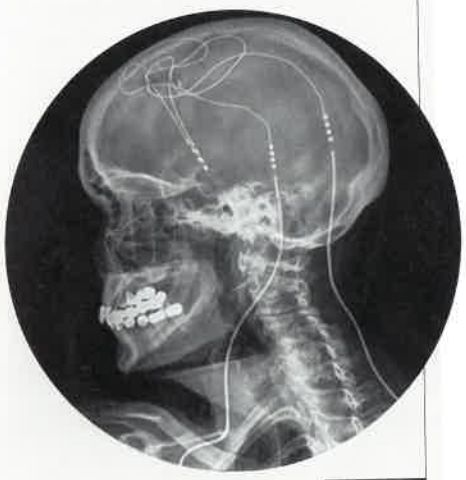
'ELECTROCEUTICALS'

Power Therapy for the Brain

The use of electricity as medicine has come far since the first cardiac pacemaker. Implanted electrodes, visible in this x-ray, deliver electric pulses known as deep brain stimulation (DBS). These "brain pacemakers" have effectively treated conditions including obsessive-compulsive disorder and Parkinson's disease and are being tested in Alzheimer's patients to improve focus, memory, and judgment. A Cleveland Clinic study of DBS to spur stroke recovery has shown promising results. A 2015 stroke robbed a patient of function on her left side—but after months of physical and occupational therapy and DBS, she plays catch with her grandkids and even threw the opening pitch at a Cleveland Indians game. –PATRICIA EDMONDS



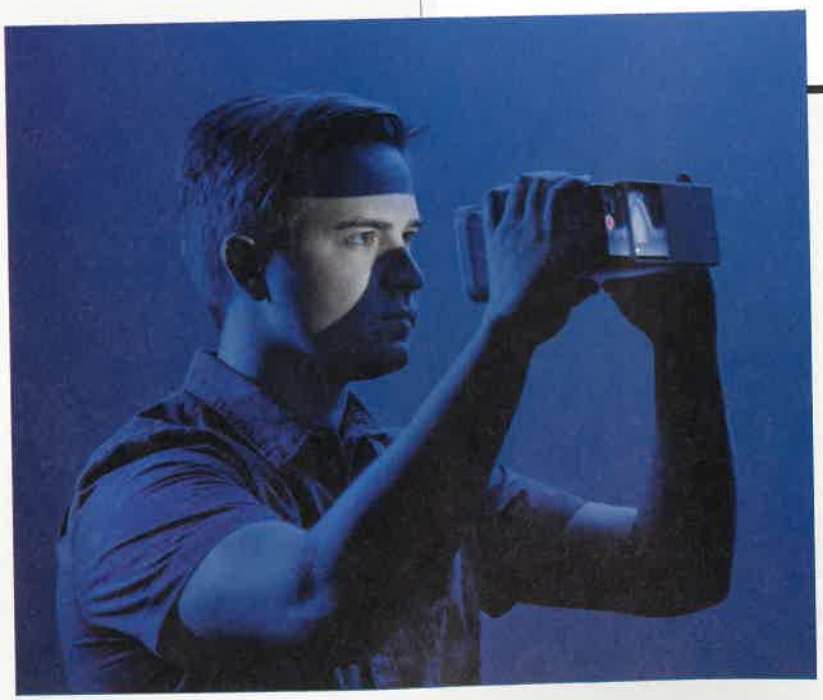
bacterial or viral infection, and the best drugs to treat it, can mean long waits for blood cultures. But scientists have developed biochips that can do a complete microbial scan in a couple of hours, without culturing—and in the process may identify mutations that make some microbes antibiotic resistant.

The boom in research into the human microbiome—the trillions of bacteria on and in each individual's body—is encouraging new modes of diagnosis and increasing understanding. Genetic analysis could help unlock the many secrets of the gut microbiome, believed to play a role in the risk and development of obesity, inflammatory bowel disease, cardiovascular disease, and even neurologic conditions.

Thanks to artificial intelligence and machine learning, diagnostic tools can be trained to read tissue samples and radiologic scans. Google researchers fed more than a quarter-million patients' retinal scans into algorithms that recognize patterns—and the technology "learned" to spot which patterns predict a patient has high blood pressure or is at increased risk for heart attack or stroke. In some comparisons, digital tools produced more accurate analyses than did human pathologists, dermatologists, or radiologists.

IN THE UNITED STATES, the days of doctors routinely making house calls are long gone. Soon to follow: the practice of most medical care occurring in person in a practitioner's office, a clinic, or a hospital. Increasingly, care will be delivered in a blended, real-world-mixed-with-virtual-world model.

The majority of patient-doctor interactions don't require the "laying on of hands," or a physical exam. Private (and increasingly reimbursable) Skype-like interactions between patient and physician will take



SELFIE DIAGNOSTICS

Reading the Whites of Our Eyes

A smartphone app in development at the University of Washington could help diagnose pancreatic cancer by checking the whites of the eyes for signs of jaundice. Snap a selfie and the app would use it to spot elevated bilirubin levels, a possible sign of the disease. –LC

PHOTOS, FROM TOP: OHIO STATE UNIVERSITY WEXNER MEDICAL CENTER; REBECCA HALE, NGM STAFF

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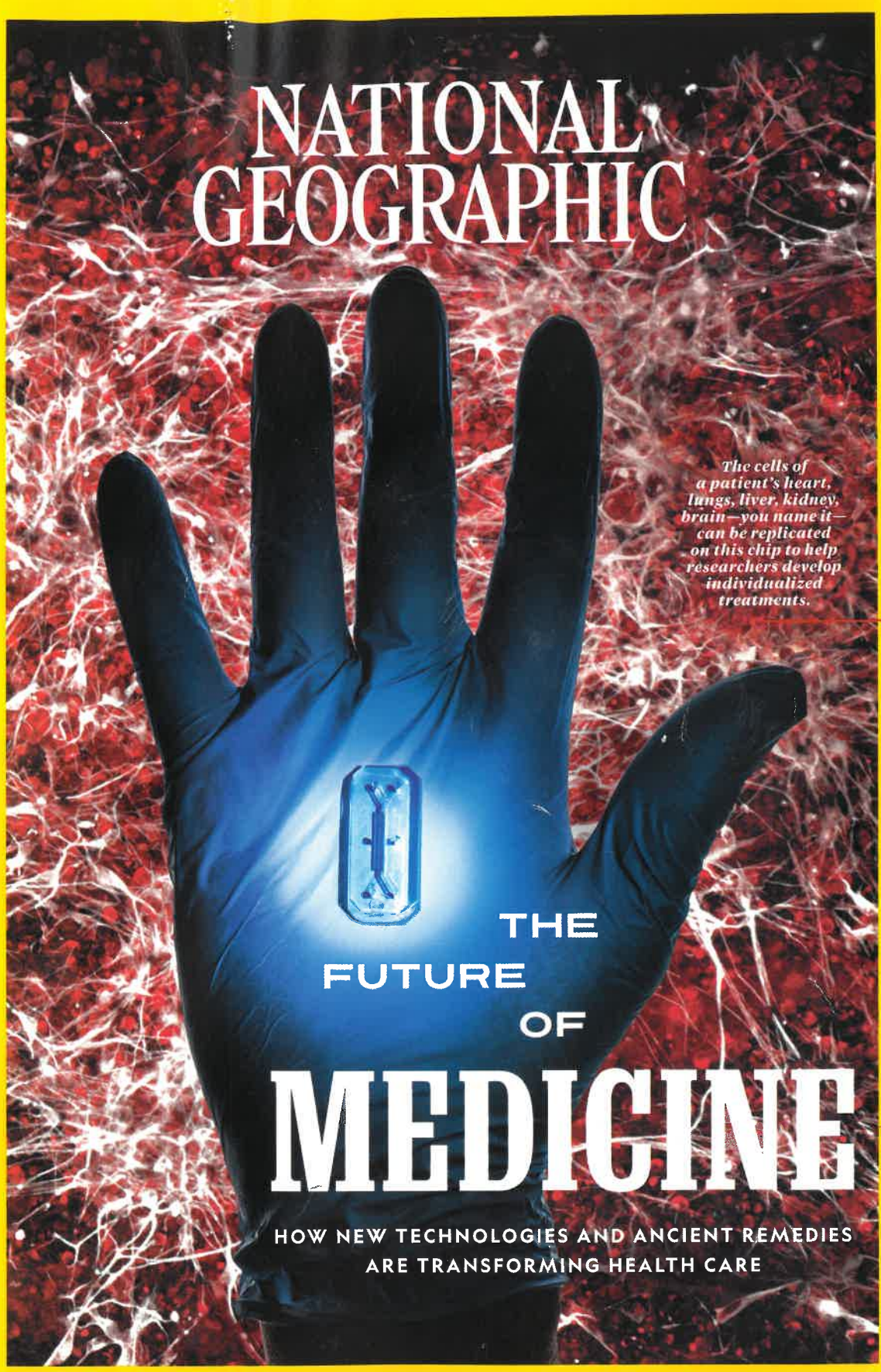
NATIONAL GEOGRAPHIC



The cells of a patient's heart, lungs, liver, kidney, brain—you name it—can be replicated on this chip to help researchers develop individualized treatments.

THE FUTURE OF MEDICINE

HOW NEW TECHNOLOGIES AND ANCIENT REMEDIES ARE TRANSFORMING HEALTH CARE