

## Introduction



### 10 Intersecting vulnerabilities, cascading consequences

Why the government must act as an engine for academia and industry. *By Shirley Ann Jackson*



15

## 10 Breakthrough Technologies 2022

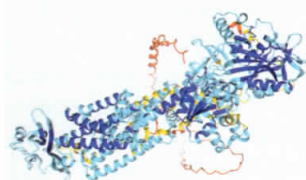
From the first parasite vaccine to the accurate prediction of 3D protein structures, these 10 innovations will shape our world.

## Features



### 24 The pill that could end covid-19

New antiviral drugs may help quell the pandemic—and prevent the next one. *By Antonio Regalado*



### 30 DeepMind's big science experiment

Demis Hassabis talks about AlphaFold and why science is the next grand challenge for his firm's AI. *By Will Douglas Heaven*



### 36 The hacker-for-hire industry is now too big to fail

This is a moment of turbulence and change for the hacking business. But the demand is here to stay. *By Patrick Howell O'Neill*



### 38 Follow the virus

Genomic surveillance is helping us spot new variants and figure out how to respond. What else could it help us do? *By Linda Nordling*



### 44 The final frontier (finally)

After decades of unmet promises, the spaceflight industry started sending more civilians into space last year. But to what end? *By Adam Mann*



### 46 Superconducting magnet revives fusion dreams

A new startup is building a fusion prototype that could finally make carbon-free power a commercial reality. *By James Temple*



### 54 A milestone in the fight against malaria

The WHO's decision to approve the first malaria vaccine will change the way we fight the deadly disease—and possibly other killer parasites. *By Adam Piore*



### 58 Getting organized

Tech workers around the world are flexing their muscles more than ever. *By Jane Lytvynenko*



### 64 Scrubbing the air

A new plant in Iceland aims to reverse humankind's legacy of harmful emissions. *By Kristján Maack and Casey Crownhart*

## Essays

### 73 The long game

Deep Blue beat Garry Kasparov at chess—only to be eclipsed by the deep-learning revolution. But it may get the last laugh. *By Clive Thompson*

### 79 Big technology is slowing innovation

The great IT revolution is no longer promoting economic dynamism. It's preventing it. *By James Bessen*

### 84 Before the metaverse

The roots of the concept extend back far beyond Neal Stephenson's *Snow Crash*. *By Genevieve Bell*

### 88 Desperately seeking fusion

Cover stories through the decades trace our on-again, off-again affair with fusion power.

## The back page