Bloomberg Businessweek

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Special Issue

THE NEW SPACE AGE

Farther, faster, cheaper — the next economic frontier is within reach

COUNTDOWN

A crowd on the beach in Titusville, Fla., watches the launch of Apollo 11, the first manned mission to land on the moon, on July 18, 1969. Photo ☐ David Burnett/ Contact Press Images

■ They say there are only two plots: Species goes on a journey, and aliens arrive in town. UFO sightings aside, humans have been living the first story for decades. The first stage of the trip began in 1957, when *Sputnik 1* arced its way around the world, and ended in 1972, when Apollo 17 Commander Gene Cernan traced his daughter's initials in moondust and stepped off the lunar surface. The second big stage is upon us now.

A trail marker was laid down in February, when SpaceX equipped a Falcon Heavy rocket with a Tesla Roadster and a data crystal containing Isaac Asimov's *Foundation* trilogy and fired it toward Mars, then landed two of the Falcon's boosters in synchrony at Cape Canaveral. At least 2.3 million people watched the YouTube livestream—high by internet standards, if far short of the hundreds of millions who tuned in for the first moon landing. Where the Apollo era was marked by singular, cost-is-no-object technological feats and suffused with political and cultural meaning, the new one has been more diffuse and democratic, fueled by ever-cheaper launches that have opened space to startups, researchers, and smaller countries. A full-fledged space economy is within reach, and with it, perhaps, a permanent human presence above.

Technology has, in stunning fashion, shown us that we can become a spacefaring species. But those of us who don't speak vector calculus will be more than gawkers. We'll help to determine how we go. The shift to a more accessible, urgent, and potentially profitable era of space exploration means there are decisions to make about ownership, environmental impact, and more.

The groundwork for these debates was laid by the Outer Space Treaty, which went into force in 1967, almost exactly 10 years after *Sputnik 1* was ▶

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A UV image of the glove Neil Armstrong wore when he left the Apollo 11 lunar module to walk on the moon. Photo ☐ Courtesy Smithsonian's National Air and Space Museum ▷

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◀ launched. The pact's full name–the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies–captures its spirit. With its first article, the accord held that space exploration "shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind." It also banned weapons of mass destruction in space, forbade national appropriation by claim of sovereignty, and made parties to the treaty responsible for nongovernmental actors based on their soil.

At the time, the pact was seen as a way to head off some of the dystopian nightmares fed by the Cold War and the nuclear arms race. But it also created an optimistic road map, casting spacefaring as a collective project, led by the great powers yet leaving no one behind. Signing the document, the famously combative Lyndon Johnson sounded downright un-Johnsonian. "It means that astronaut and cosmonaut will meet someday on the surface of the moon as brothers," he said, "and not as warriors for competing nationalities or ideologies." Of course, Johnson had just dramatically escalated the Vietnam War. Nationalities and ideologies die hard.

In the wake of the Apollo missions, the United Nations forged an even more idealistic pact, the Moon Treaty of 1979. Although Armenia became the latest country to accede to it earlier this year, it has mostly foundered, with only 18 parties. Partly this is because the U.S. backed off, under pressure, according to news reports of the day, from the L5 Society, a 3,600-member collection of space-colony enthusiasts. A lobbyist for the group testified that the treaty–which cast the moon and its resources as "the common heritage of mankind" –would create "a ▶

◀ system of international socialism" and "foreclose the commercial uses of outer space by American private enterprise."

Since then, U.S. governments have carved out a bigger role for space capitalism. Under Ronald Reagan, NASA created a commercial programs office. George W. Bush released a policy that emphasized private contracting. Barack Obama signed the U.S. Commercial Space Launch Competitiveness Act, which held that American citizens could keep anything they brought back from space. (One asteroid-mining executive called this "the single greatest recognition of property rights in history." Others saw it as potentially contravening the Outer Space Treaty's prohibition on national appropriation.) And Donald Trump issued a directive establishing a regulatory "one-stop shop" under the Department of Commerce for companies seeking to launch satellites, land on asteroids, or build fuel stations on the Saturnian moon of Mimas.

Just how big a space economy could get is impossible to know, though Morgan Stanley released a study last year estimating that revenue from the global industry will increase to at least $1.1 trillion by 2040, more than triple the figure in 2016. The company ascribes much of that future growth to satellite and rocket services, anticipating products such as orbital internet and even rocket package delivery. It doesn't account for the more aspirational possibilities presented by tourism or mining, nor by megaprojects such as NASA's Lunar Orbital Platform-Gateway, a proposed staging ground for lunar and other deep-space missions.

The moment has echoes of the early seafaring and railway eras. Forge the infrastructure, the thinking goes, and ingenuity will take it from there. The innovations—and abuses—of those eras argue for careful thought as the tracks go down, though. Will the Commerce Department take care to ▶

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Global space economy

Data ☐ Morgan Stanley

Photo ☐ Sean Lemoine

A man and his rocket in the Mojave Desert for LDRS, an annual rocketry event, in June 2016.

LAUNCH

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Photo ☐ Courtesy World View

Cover

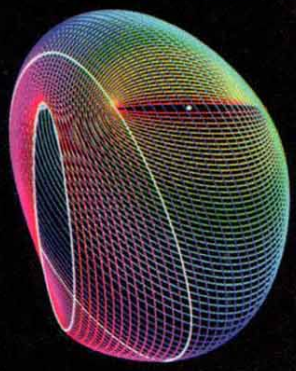
SpaceX Falcon 9 launch on April 18, 2018, Cape Canaveral, Fla.

Photo ☐ John Kraus

Photograph by Steven Brahms

Photograph by John A. Chakeres

II ORBIT



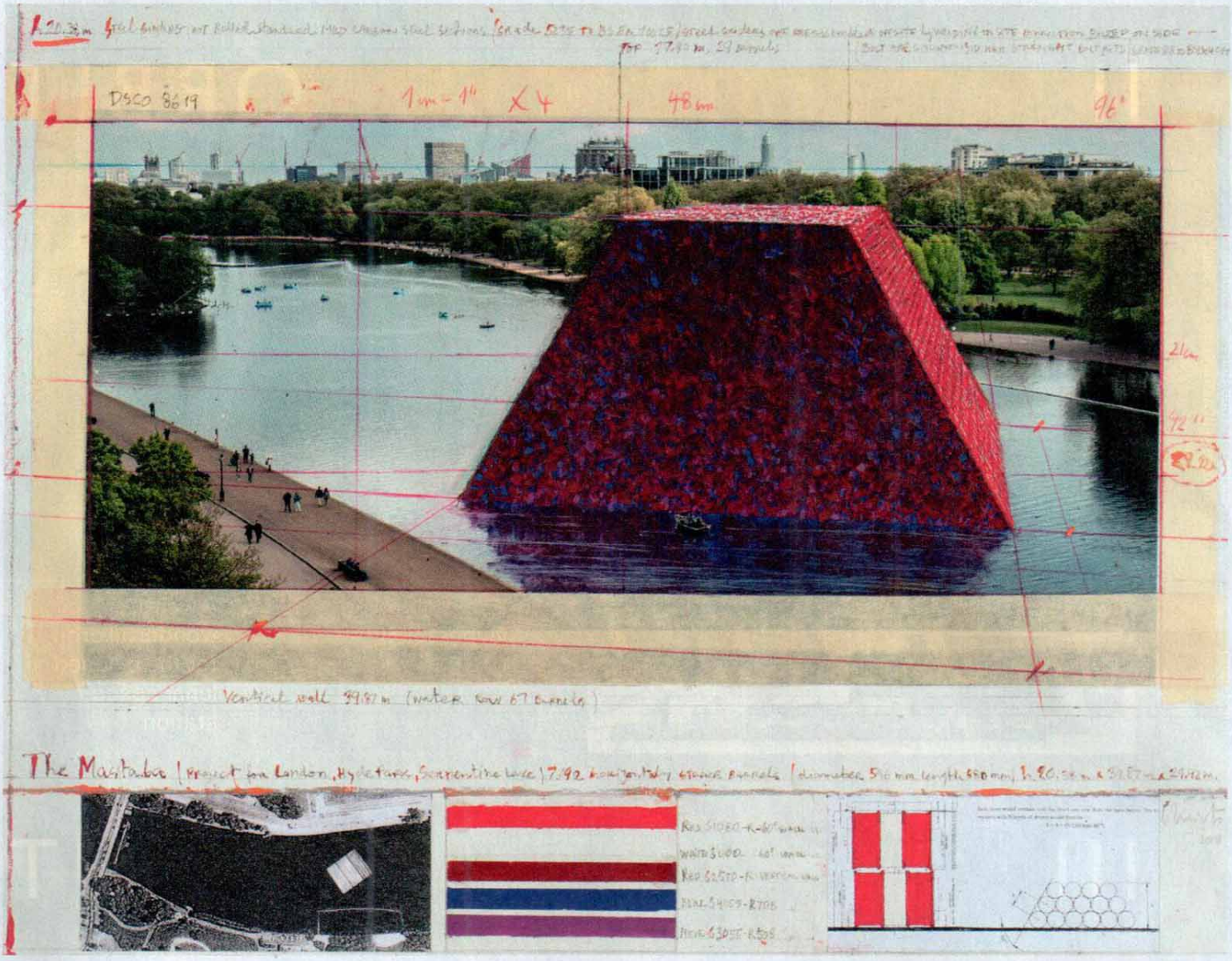
Satellite image ☐ Courtesy Iceye. Rendering ☐ Courtesy Purdue University School of Aeronautics and Astronautics, Ai Solutions

Photograph by Tony Luong

III FAR OUT

Photo ☐ Raffaele Petralla/ Prospekt

Image ☐ Courtesy ESA



Christo and Jeanne-Claude

LONDON 2018

THE LONDON MASTABA
SERPENTINE LAKE
HYDE PARK, 2016-18

18 June – 23 September 2018
The Serpentine Lake, Hyde Park
London W2 2UH

EXHIBITION
CHRISTO AND JEANNE-CLAUDE:
BARRELS AND THE MASTABA 1958-2018

19 June – 9 September 2018
Serpentine Gallery, Kensington Gardens
London W2 3XA

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SERPENTINEGALLERIES.ORG

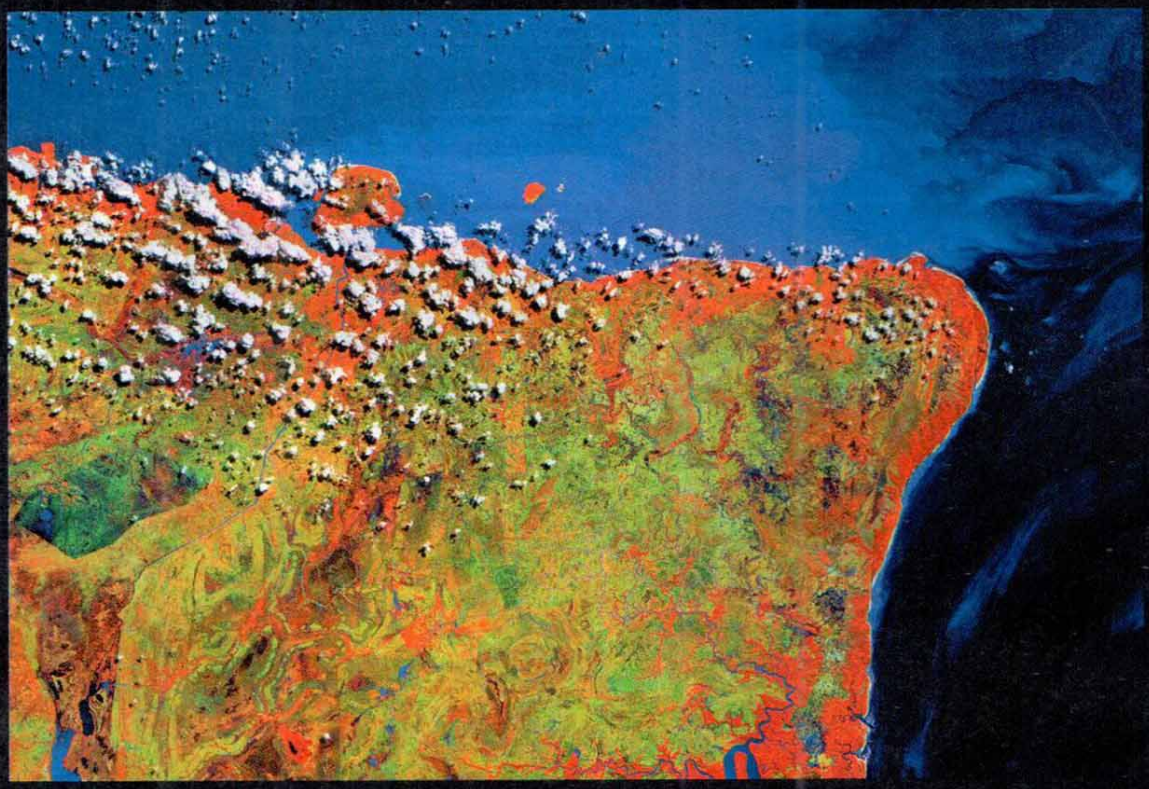
Christo *The Mastaba (Project for London, Hyde Park, Serpentine Lake)* Collage 2018: 43.1 x 55.9cm, Pencil, wax crayon, enamel paint, colour photograph by Wolfgang Volz, map, technical data, mylar and tape. Photograph: André Grossmann © 2018 Christo

I LAUNCH

The space shuttle *Endeavor* blasts off from Kennedy Space Center on May 25, 2011. Photo ☐ Courtesy NASA

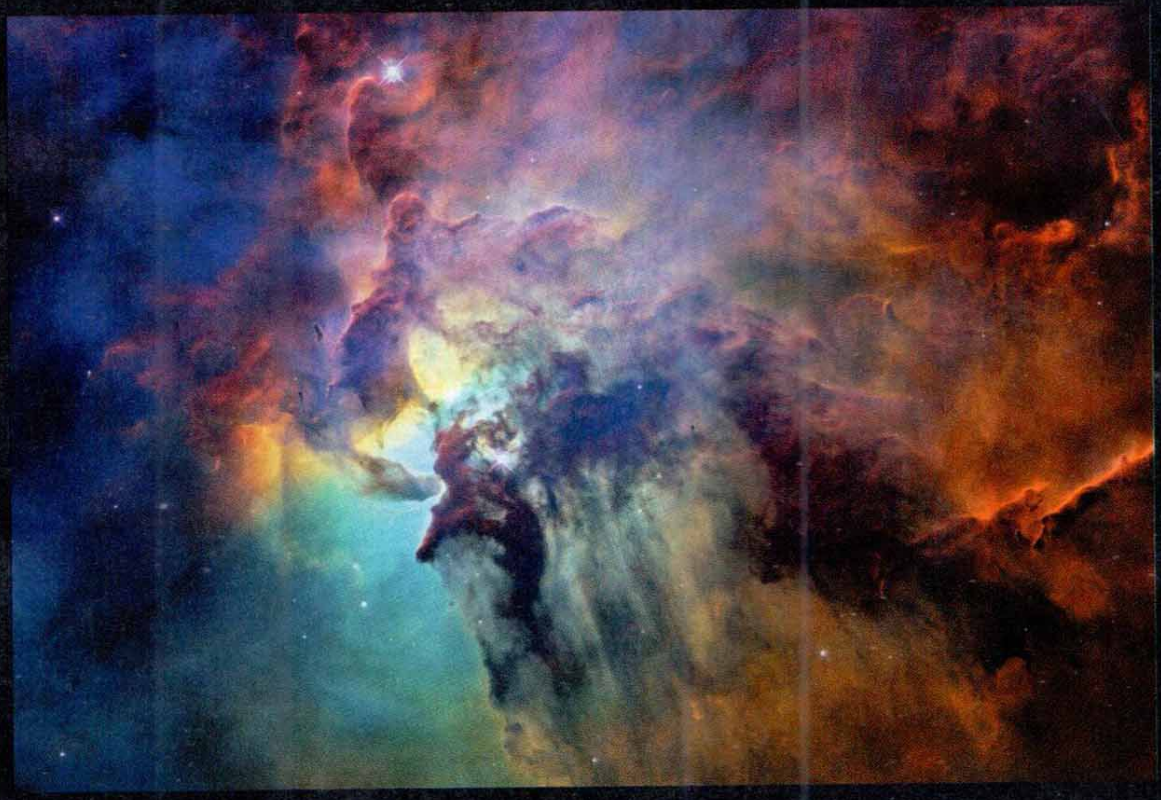
II

ORBIT



A view of northern Brazil's Marajó island from the *Copernicus Sentinel-2A* satellite. Photo ☐ Courtesy ESA

III FAR OUT



The Lagoon Nebula, a vast stellar nursery 4,000 light-years from our solar system.

Photo ☐ Courtesy NASA