

Science Focus

How an illegal drug
COULD TREAT DEPRESSION

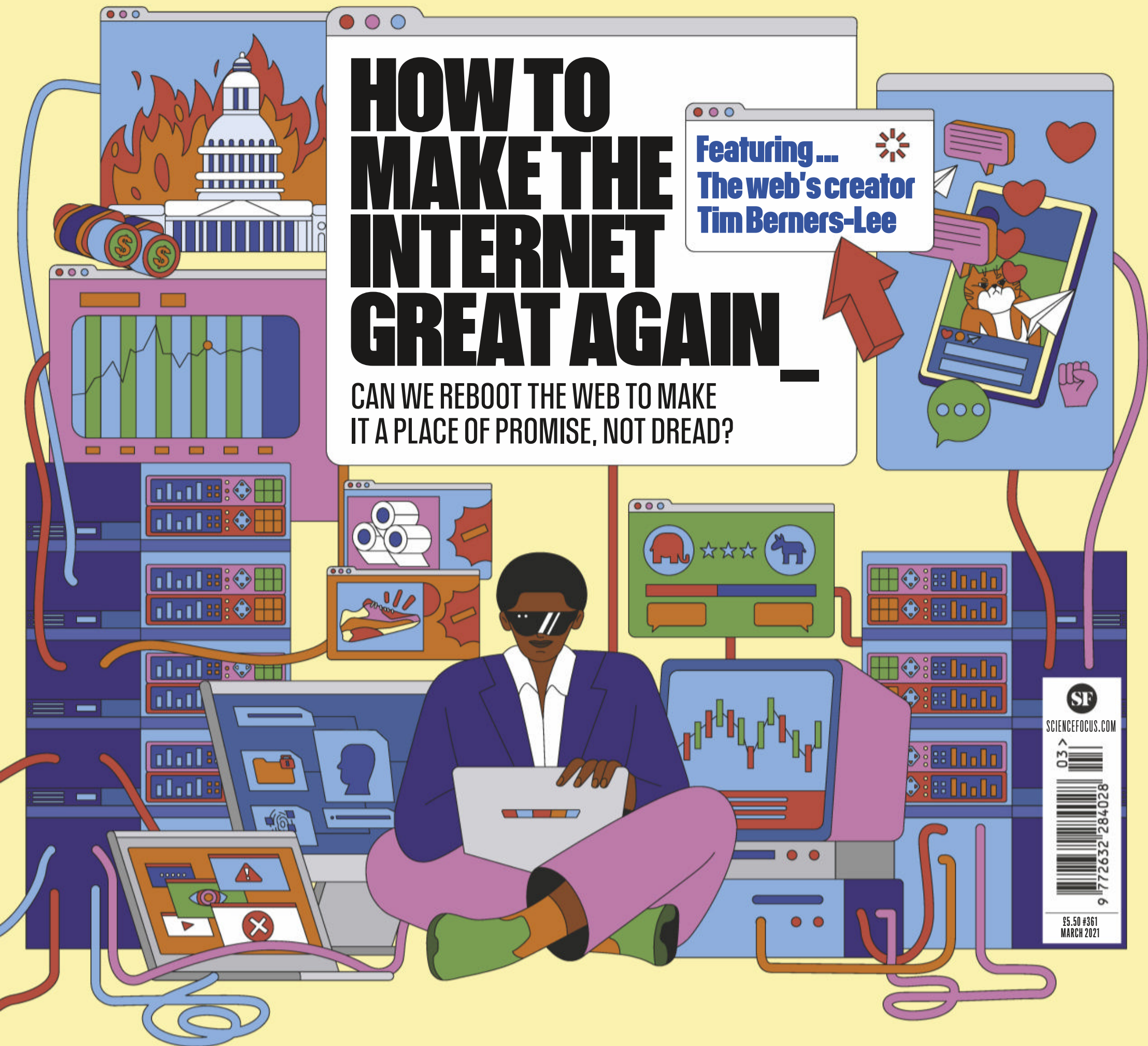
The Harvard astronomer
HUNTING FOR ALIEN TECHNOLOGY

Vaccination versus
THE COVID-19 VARIANTS

HOW TO MAKE THE INTERNET GREAT AGAIN

CAN WE REBOOT THE WEB TO MAKE IT A PLACE OF PROMISE, NOT DREAD?

Featuring...
The web's creator
Tim Berners-Lee



SF
SCIENCEFOCUS.COM
03 >
9 772632 284028
£5.50 #361
MARCH 2021

IN THIS ISSUE

Diet

History

Nature

Can a pill help people lose weight? | The women we don't talk about | Are rats claiming our empty cities?

SPACE

Destination: Mars

Every 26 months, Mars reaches the closest point to Earth in its orbit of the Sun, creating an ideal launch window for spacecraft to make the seven-month journey between the planets. The most recent window opened on 17 July 2020, with three missions arriving on the Red Planet last month. Here's what they hope to tell us about our cosmic neighbour...

PERSEVERANCE

In the Jezero Crater, a dried-up lake, NASA's Perseverance is making itself at home. Equipped with five science cameras, the rover will search for signs of microbial life that may have existed in shoreline or lakebed sediments billions of years ago. Rock core samples will be collected, and some of these priceless commodities are scheduled to make their way to the UK in around 10 years' time.

An oxygen source will be critical for future crewed missions to Mars, which is where Perseverance's onboard oxygen generator comes in. Equivalent to running a fuel cell in reverse, MOXIE will demonstrate technology that splits atmospheric carbon dioxide molecules into oxygen and carbon. But for now, it's the helicopter Ingenuity that's making the headlines. Scientists are preparing it for the first-ever powered flight on another planet, having survived the journey strapped to Perseverance's

belly. If successful, this historic achievement could pave the way for future missions to places like Titan, a world many believe to be analogous to early Earth.

Agency: NASA and JPL

Landing site: Jezero Crater

Mission length: One Martian year (687 Earth days)

Instruments:

Mastcam-Z Camera system Studies surface minerals

MEDA Measures wind, temperature, pressure, humidity and dust

MOXIE Demonstrates how to produce oxygen on Mars

PIXL X-ray spectrometer Identifies chemical elements, and has a camera for close-up images

RIMFAX GPR Used to map subsurface geology

SHERLOC Searches for organics, minerals and potential signs of life

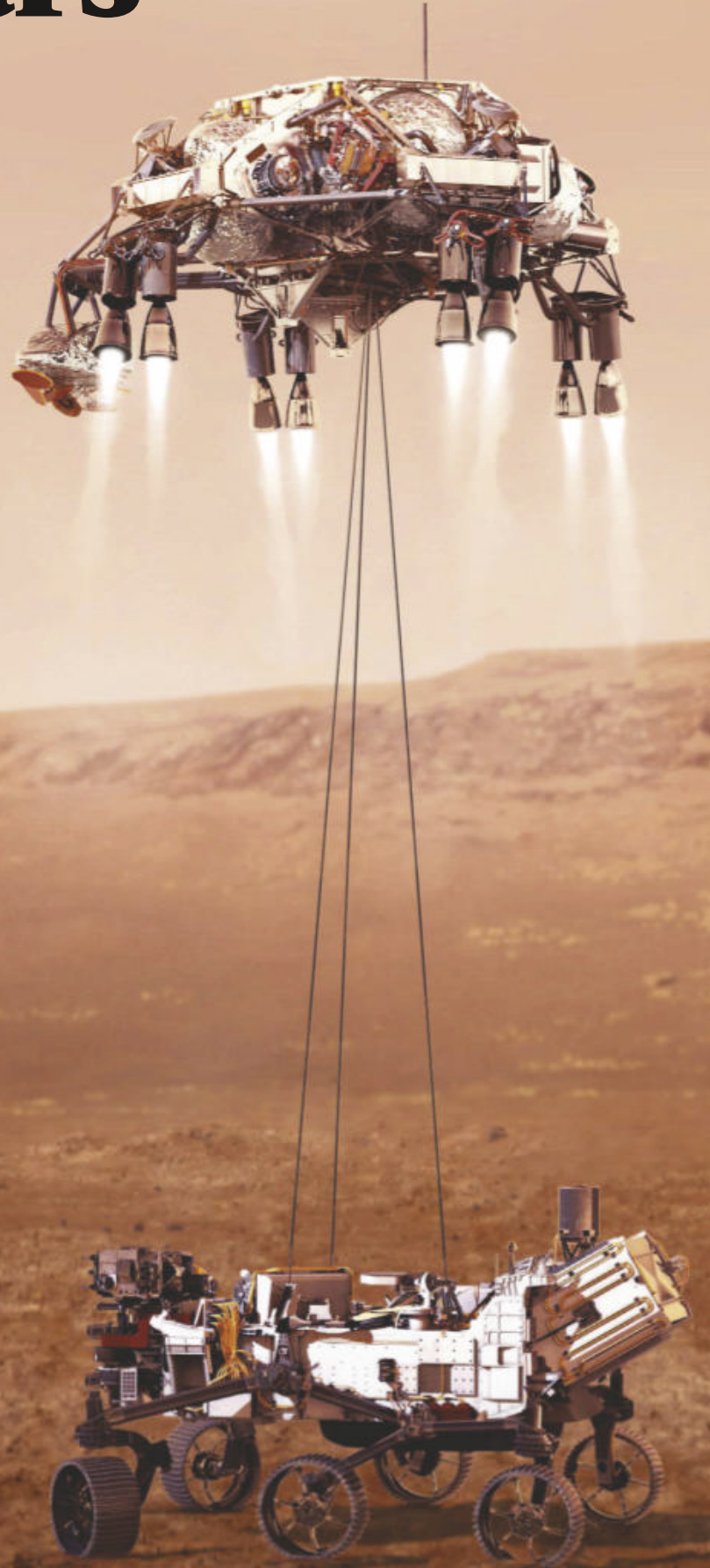
SuperCam Camera Examines material, and has lasers and spectrometers to look for organic compounds

Ingenuity Mars Helicopter technology demonstration

Weight: 1,025kg

Size: 2.9x2.7x2.2m

Cost: \$2.7bn



Timeline

19 JUL 2020

Hope launches from Tanegashima Space Center, Japan

23 JUL 2020

Tianwen-1 launches from Wenchang Space Launch Center, China

30 JUL 2020

Perseverance launches from Cape Canaveral, Florida

5 FEB 2021

Tianwen-1's first image of Mars, 2,180,000km from the surface

9 FEB 2021

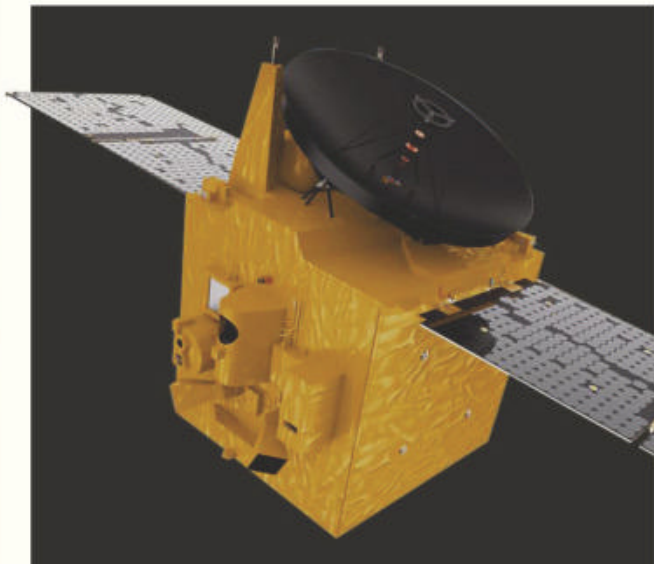
Hope enters orbit

10 FEB 2021

Tianwen-1 enters orbit; Hope sends back its first image of Mars

18 FEB 2021

Perseverance lands, sending back its first image



HOPE

The first-ever interplanetary mission by the United Arab Emirates (UAE) is currently in a highly elliptical orbit before beginning a transition phase. It will reach its Science Orbit in May. Hope aims to provide the first complete picture of the thin Martian atmosphere and seasonal variability, as well as addressing lingering questions surrounding hydrogen and oxygen escape.

Agency: United Arab Emirates Space Agency (UAESA)

Target: 22,000km-by-43,000km orbit, which takes 55 hours to complete

Mission length: One Martian year (687 Earth days)

Instruments:

EXI Takes high-res photographs

EMIRS Examines temperature profile, ice, water vapour and dust in the lower and middle atmosphere

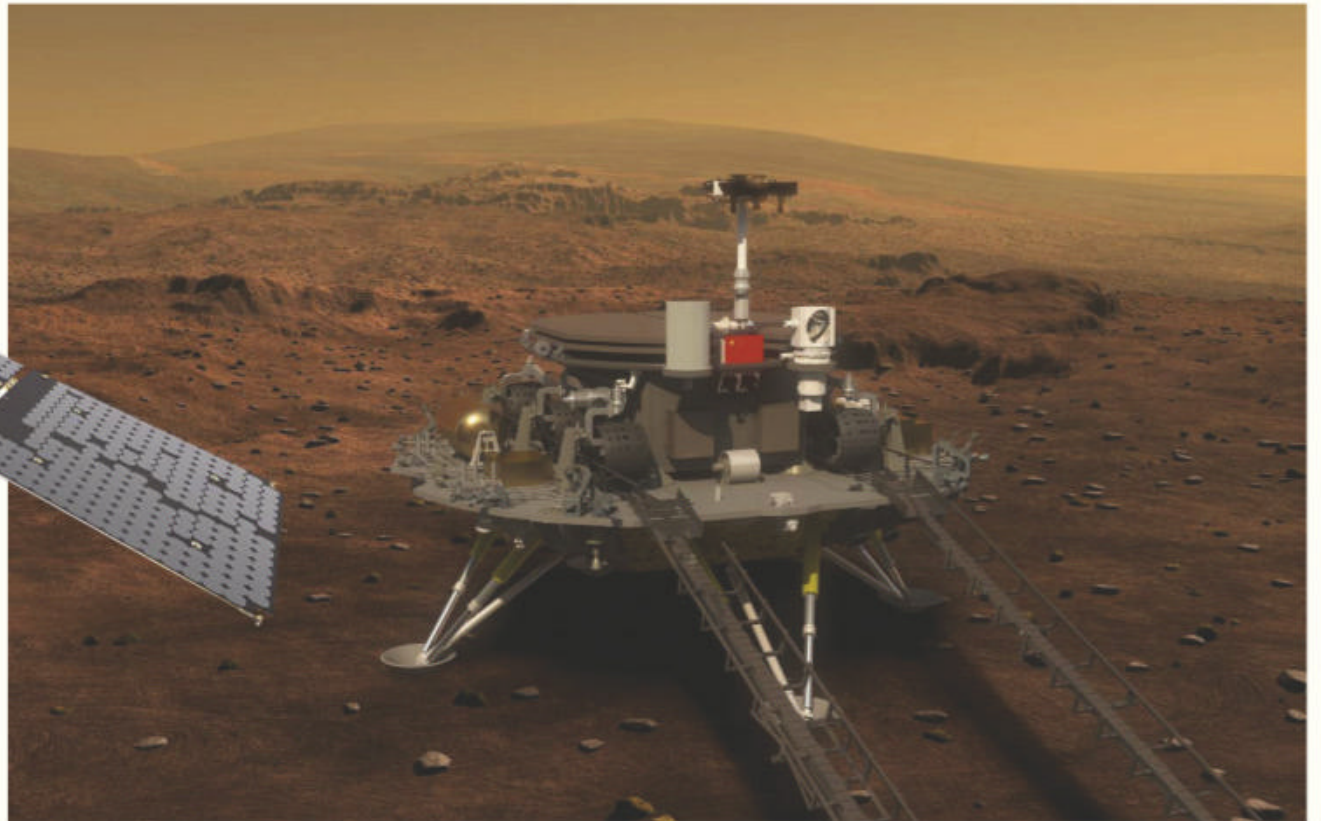
EMUS Studies upper atmosphere, as well as hydrogen and oxygen escape

Launch mass: 1,350kg

Size: 2.37x2.90m (3x7.9m open)

Cost: \$200m

NASA/JPL X2, ALAMY



TIANWEN-1

Entering orbit less than 24 hours after Hope, China National Space Administration's Tianwen-1 is on a reconnaissance mission before a lander-rover duo attempts touchdown in May. The solar-powered rover will examine surface and subsurface geology, and will look for biosignatures indicative of past life. In potentially the first-ever Martian sample return mission, China aims to transport pristine geological samples back to Earth.

Agency: China National Space Administration (CNSA)

Rover landing site: Utopia Planitia

Mission length: One Martian year (orbiter)

90 Martian days (rover)

Orbiter instruments:

Medium and high-res cameras Study topography, morphology and geology

Magnetometer Studies interaction between ionosphere, magnetosheath and solar wind

Subsurface radar Detects subsurface structures and underground water-ice distribution

Mineralogy spectrometer Determines mineral composition and distribution

Mars ion and neutral particle analyser Studies atmosphere escape and investigates solar wind interaction

Energetic particle analyser Analyses charged particles in the atmosphere

Rover instruments:

Ground-penetrating radar Images below the surface

Magnetic field detector Detects magnetic field

Climate station Measures temperature, air pressure and wind

Surface compound detector Looks for evidence of life

Multispectrum camera Determines material composition and distribution

Navigation and topography camera Provides 360° views for navigation

Launch mass: 5 tons

Size: 2.6x3x1.85m (rover)

Cost: Unknown

22 FEB 2021
Perseverance sends back first-ever audio from Mars

APR 2021
Hope moves into Science Orbit; Ingenuity conducts first test flight

MAY 2021
Tianwen-1 orbiter dispatches lander and rover to Utopia Planitia

29 DEC 2022
Tianwen-1's primary mission ends

6 JAN 2023
Perseverance begins extended mission

13 MAR 2023
Hope begins extended mission

2030
Potential date for Tianwen-1 samples to be returned to Earth

2031
Potential date for Perseverance samples to be returned to Earth