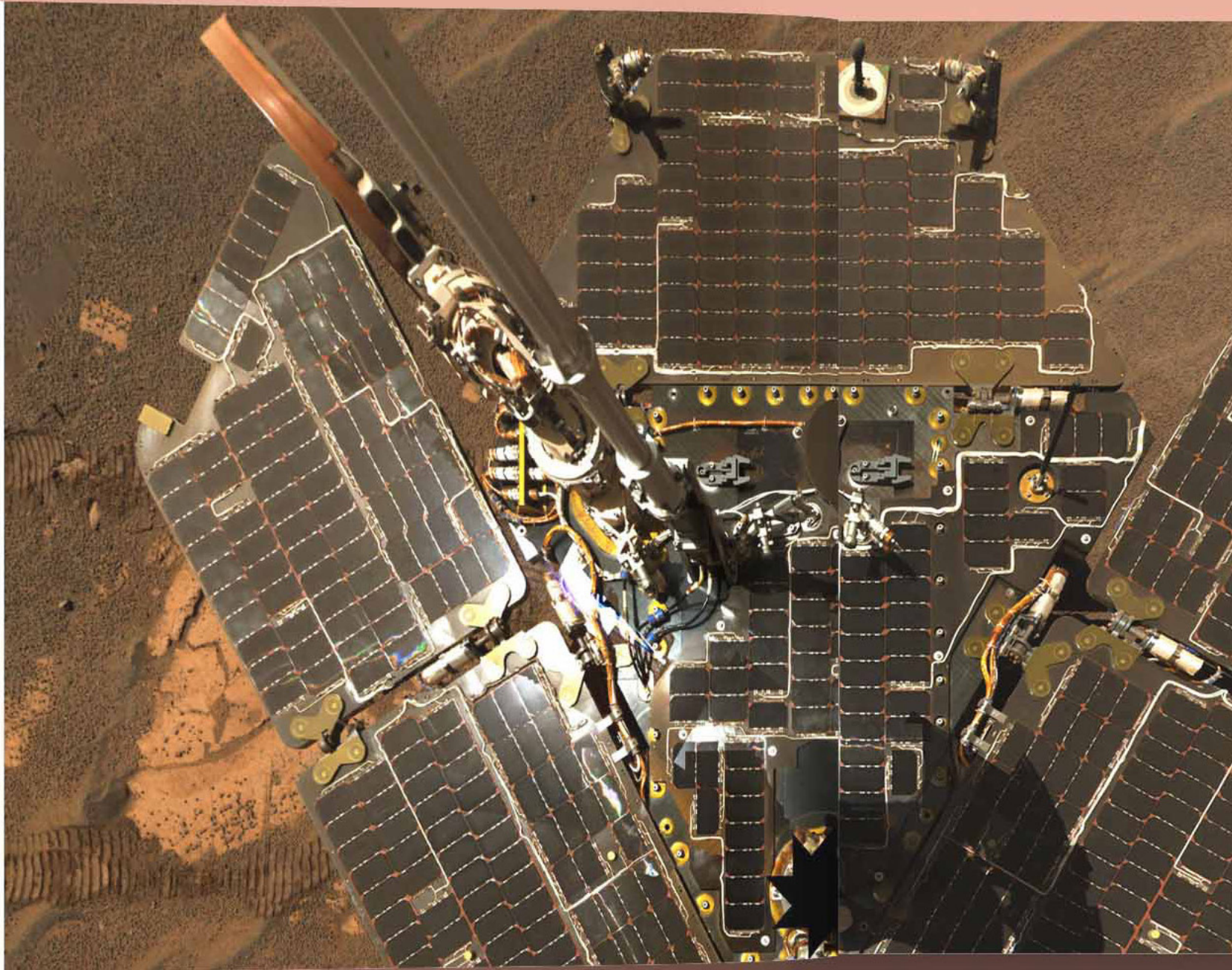# The Last Year

Book Design
December 2019
10 × 10 in.

The Last Year is a text and image book chronicling the last twelve months of reports from the NASA Opportunity Mars rover prior to its missions' end. Each month is described in relation to the number of days (sols) on Mars and juxtaposes raw data and photographs transmitted by Opportunity beside lyric exerpts from songs that NASA played to the rover in the hopes of re–establishing contact.

THE LAST YEAR

A LOOK BACK AT OPPORTUNITY

SOPHIA KRANTZ

KRANTZ

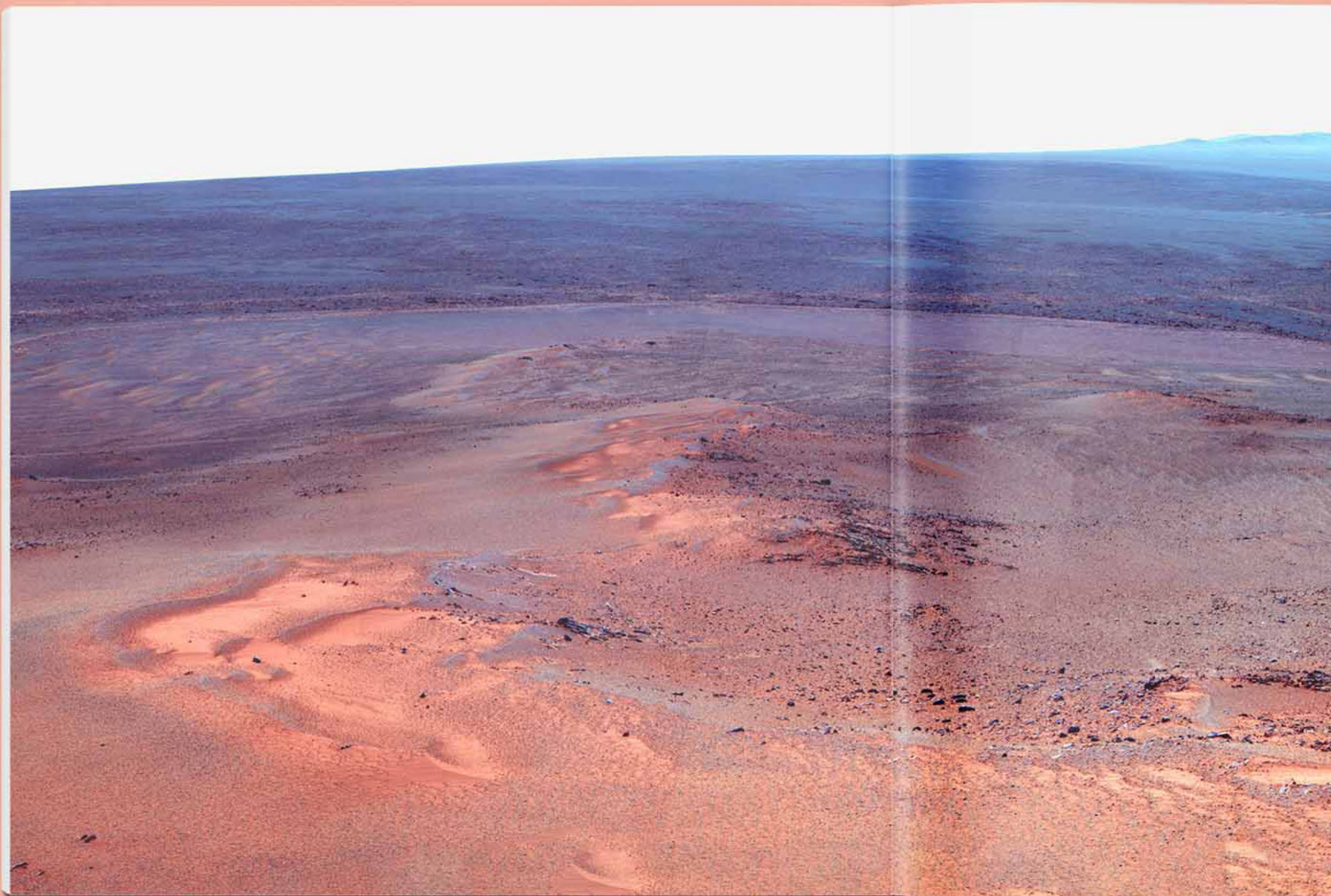THE LAST YEAR
A LOOK BACK AT OPPORTUNITY

"Opportunity was the second [of] two rovers launched in 2003 to land on Mars and begin traversing the Red Planet in search of signs of past life. The rover [was] actively exploring the Martian terrain, having far outlasted her planned 90-day mission. Since landing on Mars in 2004, Opportunity has made a number of discoveries about the Red Planet."
—NASA JPL Mission Statement

This book details the last year of Opprtunity's communications with NASA, from January 2018 until communications became troubled in August of the same year; NASA scientists at the Jet Propulsion Lab played songs to the rover to re-establish communications. As time passes differently on Mars than on Earth, the days are recorded in terms of passing sols, or suns.

JANUARY 2018

SOLS 4943–4984

"You'll take my life but I'll take yours too,
You'll fire your musket but I'll run you through,
So when you're waiting for the next attack,
You'd better stand there's no turning back."

— *The Trooper* (1998) by The Iron Maiden

Sols 5183–5189:

No signal from Opportunity has been heard since Sol 5111 (June 10, 2018). The dust storm on Mars continues its decay with atmospheric opacity (tau) over the rover site decreasing.

It is expected that Opportunity has experienced a low-power fault and perhaps, a mission clock fault and then, an up-loss timer fault. The project is continuing to listen for the rover either during the expected fault communication windows, or listening over a broader range of times using the Deep Space Network Radio Science Receiver.

The project is also sending a command three times a week to elicit a beep if the rover happens to be awake.

Sols 4971–4977:

Opportunity is continuing her winter exploration of "Perseverance Valley" on the west rim of Endeavour Crater from a location in the north fork of the local flow channel.

Color imaging of light toned bedrock and nearby streaked rocks occupied the first few sols. The Alpha Particle X-ray Spectrometer (APXS) argon integration was done on Sol 4974 (Jan. 20, 2018). A short 3 foot (1 meter) drive on the next sol positioned the rover at the light toned outcrop and some missing images were retaken.

On Sol 4977 (Jan. 23, 2018), the robotic arm was used to collect a Microscopic Imager (MI) mosaic of a surface target within the work volume of the arm. The APXS was then placed on that target. Also on that sol, the latest version of the flight software was copied over the older fallback version in preparation for a flight software update, later in the year.

Additional dust cleaning has raised solar array energy production to 644 watt-hours with an atmospheric opacity (Tau) of 0.423 and an improved solar array dust factor of 0.839.

12

Sols 4978–4984:

Opportunity is continuing her exploration of "Perseverance Valley" on Endeavour Crater. The rover has moved along the north fork of the local flow channel. Continuing the extensive collection of stereo imagery, the rover used the Navigation Cameras (Navcams) to collect two tiers of a wide panorama. Then on the next sol, the robotic arm (also called the Instrument Deployment Device, or IDD) performed an offset placement of the Alpha Particle X-ray Spectrometer (APXS) to a new target location. The Panoramic Camera (Pancam) was also used to collect several frames of a color stereo panorama.

Over the next four sols, Opportunity collected a combination of Navcam and color Pancam stereo panoramas and some targeted multi-spectral Pancam images. On Sol 4984 (Jan. 30, 2018), the IDD was used again to reach other surface targets and