PLANETS:
What Good Is a Magnetic Field?
PAGE 34

DIY:
Modding Your Scope
PAGE 60

METEOR SHOWER:
A Grand Year for the Geminids
PAGE 48

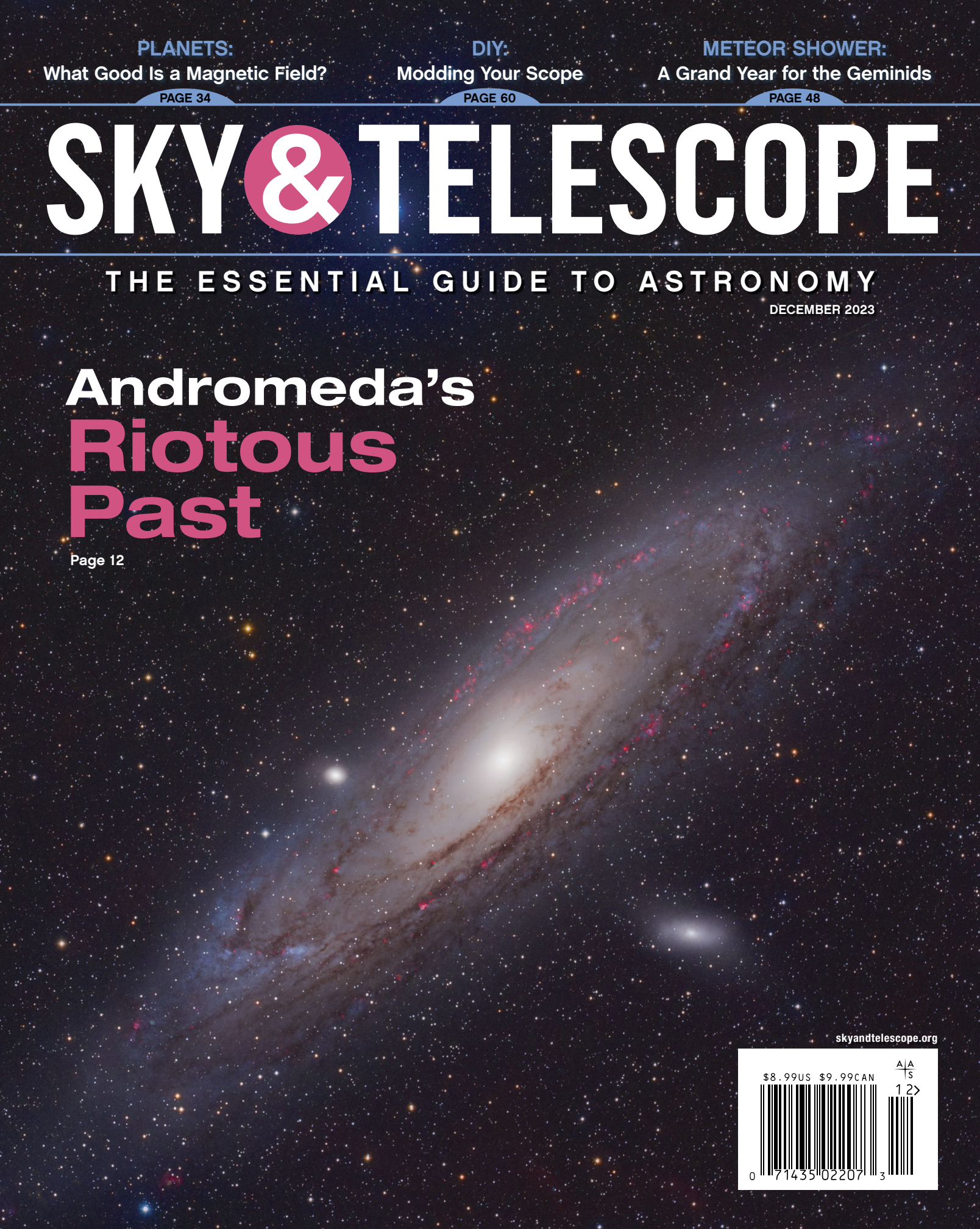
SKY & TELESCOPE

THE ESSENTIAL GUIDE TO ASTRONOMY

DECEMBER 2023

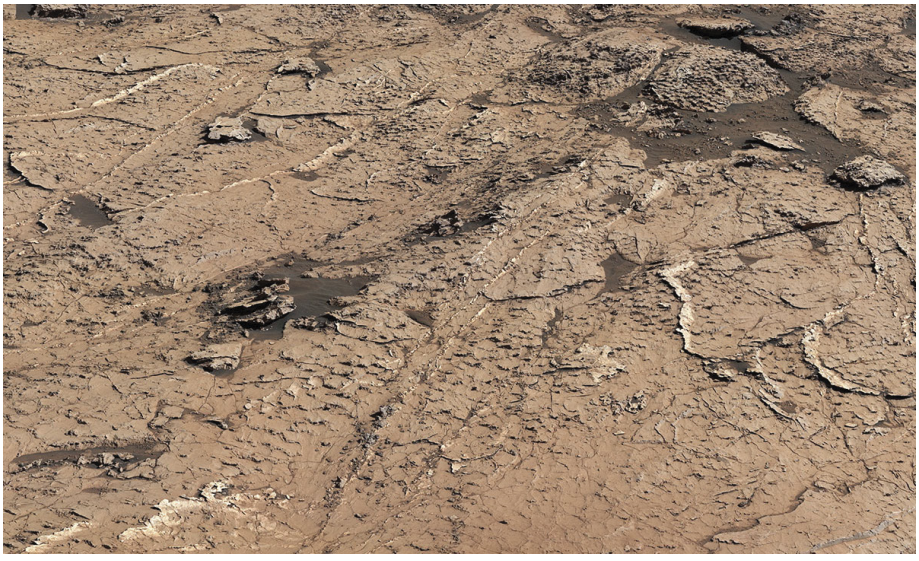
Andromeda's Riotous Past

Page 12



skyandtelescope.org

$8.99US $9.99CAN
A|A|S
12
0 71435 02207 3



SOLAR SYSTEM

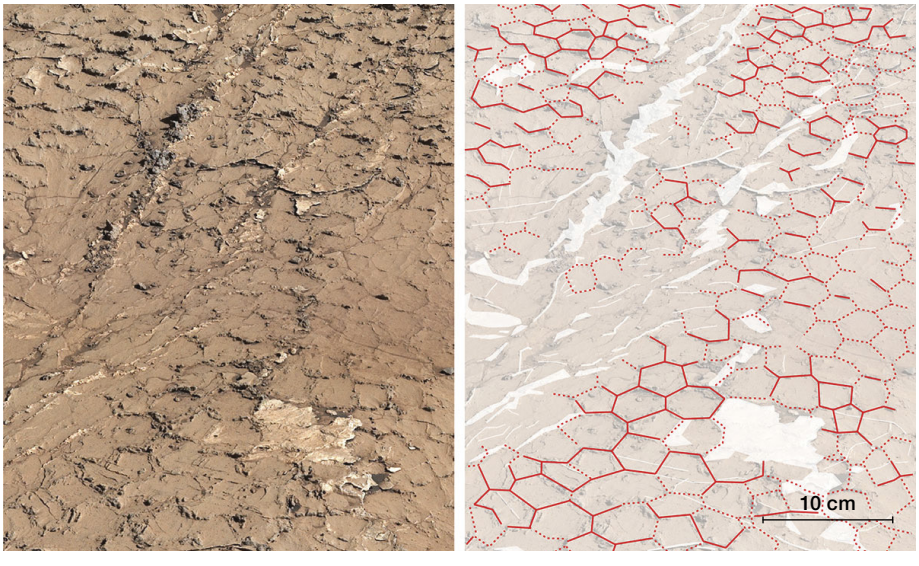
What Mud Cracks Mean for Life on Mars

PLANETARY SCIENTISTS analyzing data from NASA's Curiosity rover have spotted evidence of sustained wet-dry cycles on early Mars. The find is intriguing given that similar climatic cycles have long been linked to the advent of life on Earth.

In the August 10th *Nature*, a team led by William Rapin (University of Toulouse, France) describes mud cracks that Curiosity encountered in 2021. "These particular mud cracks form when wet-dry conditions occur repeatedly — perhaps seasonally," Rapin says.

▲ Curiosity's MastCam captured this panorama of mud cracks on Mars. Polygonal shapes form after multiple wet-dry cycles.

The rover team found the cracks while ascending Mount Sharp, the central peak that towers 5.5 kilometers (3.4 miles) over Gale Crater. The rover examined cracks it encountered near a rock nicknamed "Pontours," which lies in a transitional region between a clay-rich layer and another layer enriched with salty sulfates. Clay-rich layers tend to form in water, whereas salty layers emerge when water dries up.



▲ A close-up of mud cracks alongside the same image with the polygonal shapes outlined in red. The hexagons average 4 centimeters (1.5 inches) across.

As the Martian mud dried out, it shrank and fractured into T-shape junctions, which repeated wet-dry cycles softened into a Y shape. Where several of these junctions meet, they create the distinctive patchwork of polygonal cracks that Curiosity saw.

The mud cracks date to the Noachian–Hesperian transition 3.8 to 3.6 billion years ago. The pattern may have emerged as Gale Crater was repeatedly flooded and/or as ground water swelled upwards. Rapin and his team think that a salty sulfate crust running along the cracks' edges has preserved their shapes over billions of years.

"We know that wet-dry cycles can drive chemical reactions to obtain the building blocks of life," says Sidney Becker (Max Planck Institute of Molecular Physiology, Germany), who was not involved in the research. "Finding those conditions on Mars is an exciting discovery." That's because as the water begins to dry up, the concentration of soluble ingredients in the remaining water increases. This heightened concentration can then boost chemical-reaction rates and raise the chances of constructing the complex molecules on which life relies.

However, Becker also points out that, even if there was wet-dry cycling, we don't know if Mars had the right atmospheric or mineral ingredients for life. And even meeting those requirements is no guarantee. "The conditions needed for the origin of life might be different to the ones that actually create the needed building blocks," Becker says.

If wet-dry cycles did help create ancient life on Mars, they could also have worked against it. "The conditions to sustain life over a long period of time again could be very different," Becker says. "Since first life was likely very fragile, wet-dry cycling might have caused too much external disturbance." Life's maker could ultimately have been its destroyer.

So, while these cracks are an important piece of the puzzle, we are still a long way from being able to say whether ancient Mars hosted life.

■ COLIN STUART

NASA / JPL-CALTECH / MSSS / IRAP (2)