

SCIENTIFIC AMERICAN

Sleep
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Exploring the Sun

A total solar eclipse and new space probes
will reveal our star's mysteries



SCIENCE IN IMAGES

Lunar Lens

View of a solar eclipse—
from the moon

LAST APRIL THE MOON passed directly between Earth and the sun, blocking our star from view to observers in select portions of the Southern Hemisphere—a total solar eclipse. From Earth, the moon appeared as a dark disk as its shadow

swept across the southern Indian and Pacific Oceans.

But what did it look like *from the moon*? When Japanese company ispace executed a mission called HAKUTO-R that entered lunar orbit last year, its probe deployed a lander that, unfortunately, was lost moments before its final descent to the surface. Just days earlier, however, the craft captured a sight no human has yet witnessed in person: the eclipsing shadow of the moon sweeping across Earth's face from just under 400,000 kilometers away.

The moon's gray, crater-pocked surface dominates the image, but our eyes are drawn inexorably to the mottled blue disk near the lunar limb, the apparent edge of the moon's surface. Some of Earth's white clouds are seen, as well as brown splotches that make up Australia and part of Asia.

And look even closer. That dark discoloration on Earth's face near Australia is the shadow of the moon, cast across all that space to brush our planet's surface and give so many people the thrill of a lifetime through a total solar eclipse.

We don't yet have a proper name for

ispace, inc

EMBRYOLOGY

Splitting Errors

Divisions after conception can lead to embryo failure

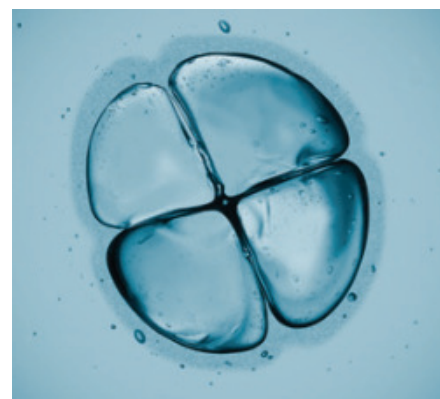
HUMAN REPRODUCTION is notoriously inefficient. Whereas the fertilized eggs of other animals, such as mice, usually progress to more complex embryo stages, fertilized human eggs often falter early on. For a recent study in *Genome Medicine*, scientists analyzed almost 1,000 embryos from *in vitro* fertilization (IVF) procedures to learn why.

Scientists know that chromosomally abnormal human embryos—those with either more or fewer than 46 chromosomes—often don't implant in the uterus, and if they do, the resulting pregnancy may end in a miscarriage or stillbirth.

Some of these abnormalities originate in the egg or sperm. In other cases, a healthy egg and sperm form an embryo that divides oddly; for example, instead of one cell dividing into two, it might become three. “There is a lot of evidence that during the first cell divisions, human embryos make a lot of mistakes,” says Claudia Spits, who studies related problems of reproduction and genetics at the Free University of Brussels.

The study authors found that these odd divisions lead to new chromosomal abnormalities, which can harm embryonic development even more than abnormalities that originate in the egg or sperm. The new errors can be “catastrophic,” says Johns Hopkins University evolutionary biologist Rajiv McCoy, the study's lead author. “A lot of times you have three, four, five missing chromosomes.”

McCoy and his colleagues used time-lapse video and a microscope to record the IVF embryos' first cell divisions. Then they



ugurhan/Getty Images

tested for abnormalities among both the surviving embryos and those that failed.

Spits says the effects of postfertilization abnormalities are “something that we have all assumed to be true, but nobody provided the evidence in the manner that [McCoy and his team] have done” by analyzing such a high number of embryos and including discarded ones.

The new study also found that division-related errors are equally common among embryos with eggs from women of all ages, whereas egg and sperm abnormalities increase as people age. The researchers suspect this finding might help explain why it is so hard even for many young, healthy couples to get pregnant. “Maybe some of the mechanisms that we are uncovering from our studies will be relevant to understanding the low level of human fertility,” says study co-author Michael Summers, a reproductive medicine consultant at London Women's Clinic. The work could also help illuminate what McCoy calls “the black box of early pregnancy loss.”

The scientists say they hope to use their results to improve IVF. For instance, if changing the cells' environment reduces the likelihood of dividing errors, Summers says, “you could potentially rescue a lot of embryos for IVF purposes because those errors are happening in the dish.”

—Gina Jiménez

this unique perspective. When the moon blocks the sun as seen from Earth, it's a solar eclipse. When Earth blocks sunlight from hitting the moon, we call it a lunar eclipse. But what do we call a view *from* the moon as its shadow sweeps across Earth—a “terrestrial eclipse”?

As human exploration of the moon advances, we'll need to nail that down. Or maybe we can just wait a little while; one day, maybe not too far in the future, people will experience this phenomenon for themselves. Perhaps we should leave the naming to them.

—Phil Plait

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—Rajiv McCoy Johns Hopkins University