BUSINESS INSIDER

A massive solar storm could wipe out almost all of our modern technology — and we'd have just hours to prepare

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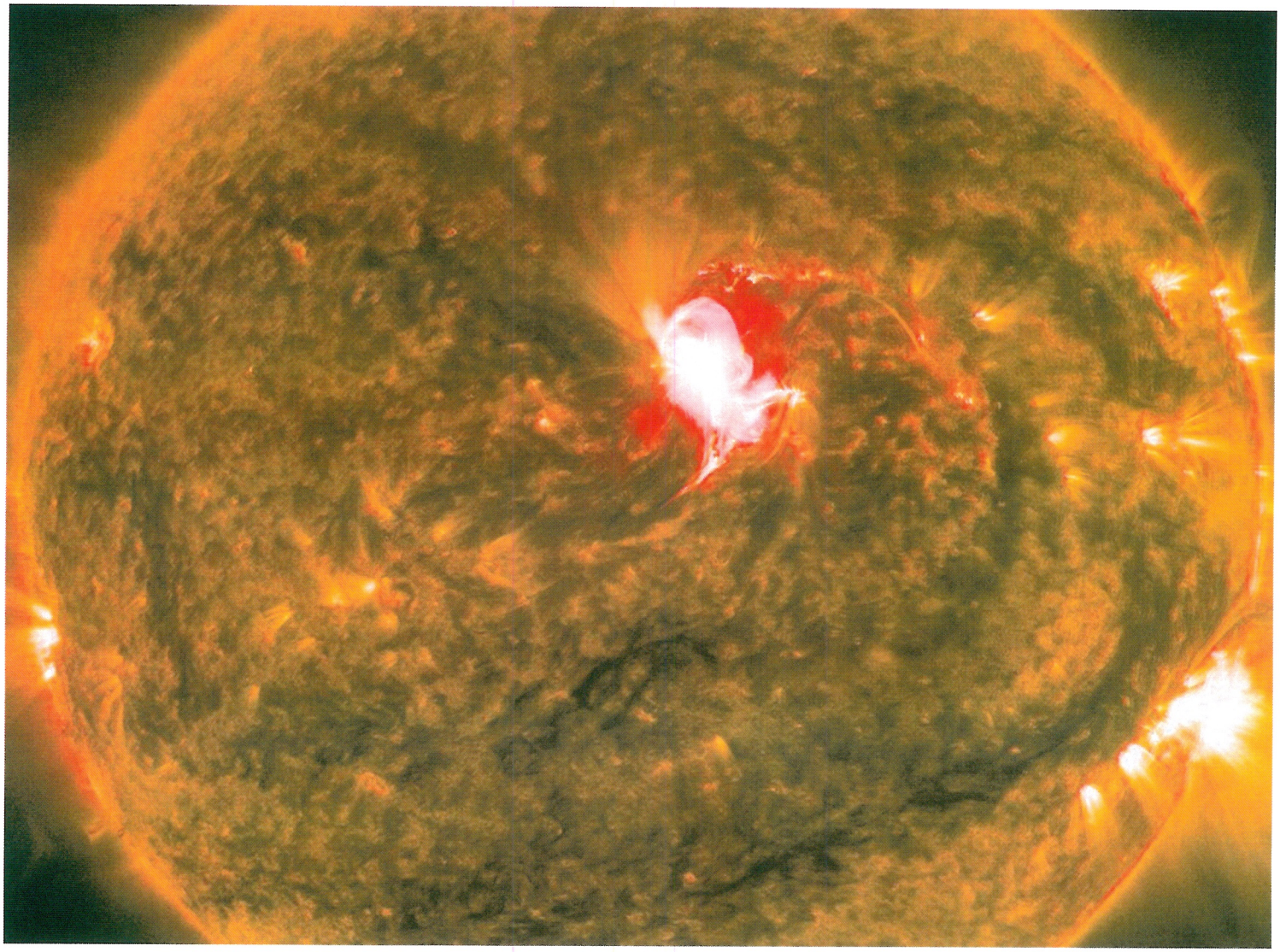


NASA

In 1859, an invisible wave crashed into the Earth.

Electrons, swept up like so much detritus in the magnetic current, coursed along telegraph wires. When they met an obstacle, like the hand of a telegraph operator, they crashed through it — delivering a sharp shock.

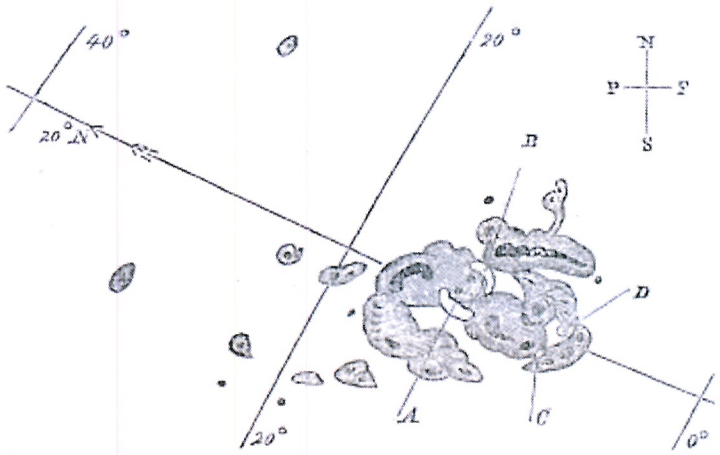
Papers in telegraph offices caught fire. Even with batteries disconnected, operators found the giddy subatomic stream could carry their messages over vast distances. Lights danced in the sky.

It was the largest solar storm ever recorded. If it happened today, it would jeopardize global telecommunications, knock out orbiting satellites, and threaten to kill astronauts.

We'd have some warning; instruments all over the world and in space now monitor the sun every second of the day. But even at the speed of light, a massive solar flare's telltale flash of radiation would leave humanity between just a few minutes and — if we were very lucky — a day to prepare for the wave of charged particles surging toward us through space.

Amazingly, way back in 1859, before all that monitoring equipment was put in place, an astronomer spotted the flare before the storm reached Earth.

At 11:18 a.m. on September 1 of that year, the English astronomer Richard Carrington stood in his private observatory recording sunspots on an image of the sun projected through his telescope onto a small screen.



Carrington's observation. The figures labeled A and B represent the flare.

Harvard

"Two patches of intensely bright and white light broke out," he wrote in his report, "Description of a Singular Appearance seen in the Sun," for the journal Monthly Notices of the Royal Astronomical Society.

"My first impression was that by some chance a ray of light had penetrated a hole in the screen attached to the object-glass, by which the general image is thrown into shade, for the brilliancy was fully equal to that of direct sunlight," he wrote.

The next morning before sunrise, NASA writes, "skies all over planet Earth erupted in red, green, and purple auroras so brilliant that newspapers could be read as easily as in daylight. Indeed, stunning auroras pulsated even at near tropical latitudes over Cuba, the Bahamas, Jamaica, El Salvador, and Hawaii."

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In the (mostly) preelectric world of 1859, most of humanity experienced the storm as little more than a strange light show — if they were even awake to see it. And aside from a few smarting fingers, it doesn't seem to have done anyone long-term harm.

As our world has grown more reliant on electronics in the last century and a half, humanity has had few glimpses of the potential dangers of solar storms to our new infrastructure. NASA records three instances dating back to 1972 of solar storms significantly disrupting daily life.

The latest example came in 2005, when X-rays from a solar flare disrupted satellite-to-ground communication and the GPS system for about 10 minutes — threatening satellite-guided air, sea, and land travel.

But none of those storms come close to the scale of the 1859 monster, known as the Carrington Event.

If a Carrington Event happened today, the world would likely have to deal with the simultaneous loss of GPS, cellphone reception, and much of the power grid. The global aircraft fleet might have to coordinate an unprecedented mass grounding without satellite guidance. Unguarded electronic infrastructure could fail outright.

We'd all have to — at least in the short term — wait for *tomorrow's newspaper* to come out to learn details of the aftermath.

"Humans in space would be in peril, too," NASA wrote. "Spacewalking astronauts might have only minutes after the first flash of light to find shelter from energetic solar particles following close on the heels of those initial photons. Their spacecraft would probably have adequate shielding; the key would be getting inside in time."

The best available estimates suggest a modern Carrington Event would cost humanity $1 trillion to $2 trillion in the first year and take another four to 10 years to achieve full recovery. A 2007 NASA estimate found the damage to the satellite fleet would cost between $30 billion and $70 billion.

Fortunately, Carrington-scale storms seem pretty rare, occurring perhaps once in 500 years. But we have no reliable way of predicting when the next one could happen.

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