Those Mysterious Sunspots

An expert examines claims of their influence on the stock market, the weather, human behavior and your TV picture

By John A. Eddy

Sunspots, the subject of this week's Nova "The Sunspot Mystery" episode on PBS, are cooler regions on the blazing surface of the sun. Through a small telescope they appear as dark dots on the bright, white background. They look like dots only because the sun is so far away; in fact, sunspots are gigantic, swirling holes, and even a small one is big enough to swallow the Earth. In sunspots are magnetic forces of tremendous strength—forces that cause the solar eruptions and flares that can reach down to rattle the top of our atmosphere. So we watch sunspots with keen interest, for they are the storm warnings of the solar system.

As I write this, astronomers are wondering what has happened to the sunspots that should now be appearing on the sun; there are few if any there. Sunspots come and go in a cycle of about 11 years, and we are now at a minimum of that pattern. That is not unusual. But the end of the present minimum is overdue: the expected rise toward the next maximum should have started more than a year ago, in the autumn of 1975. Not since 1901 have we known so long a lull in the action in the sun.

Dramatic moment as first recorded from Skylab: the moon (lower left) is about to eclipse the sun, which has been blacked out here to emphasize its corona, or atmosphere. Flat-like projections indicate the presence of sunspots.

What is happening on our sun, and what effects may we expect on Earth? Do sunspots have anything to do with
changes in the weather? The stock market? Human behavior?

Before we answer that, recall that during the years of the present sunspot minimum (1973-1976) the wheat-growing plains of our American Midwest have suffered the worst droughts since the dust-bowl years, and these Western droughts seem to occur at alternate minima in the sunspot cycle. During the present minimum in solar activity our economy has had some of its worst times since the early 1930s, which also were years of low sunspot numbers. Aren't these enough to suggest a real, cosmic connection?

It would be valuable indeed if we could identify a simple and lasting relationship between economic trends, or weather, and the number of spots on the sun, for we can predict, at least roughly, when the sun will next be active (1980-1982) and when it will get quiet again (1985-1989). This power of prediction could be even more exciting if we knew which of the many other effects claimed for sunspots were also real, for the list includes tree growth, industrial production, animal vigor, the price of corn in London, glandular secretions, building starts, births, mental attitude, vitamin enrichment, the depth of the Nile, blood pressure, wars and the quality of Burgundy wines, to name a few.

It isn't that we haven't tried. The search for practical effects of sunspots has gone on since at least 1843, when the sunspot cycle was first discovered. It was soon shown that the aurora borealis, or northern lights, was linked to sunspots, as were changes in the magnetic field of the Earth. We now know that radio, and to some extent television, reception, is affected by activity on the sun, as measured in sunspots.

But these disturbances all take place at the very top of the Earth's atmosphere—as much as a hundred miles or more above our heads, where solar changes are more directly felt. The lowest atmosphere, in which we live, is monstrously complex by comparison. Most scientists today believe that when solar disturbances related to sunspots strike the upper layers of our atmosphere, there is little if any change in the weather far below.

What is more, astronomers have been unable to find any major changes in the total amount of sunshine that strikes the Earth when sunspots come and go. Sunspots are a sign of surface action on the sun, but this activity changes the sun's total energy output very little.

In short, although we know that sunspots come and go in a cycle of 11 years, the practical, measured effects of that cycle on the Earth seem small indeed, and in most cases are probably overwhelmed by a host of other things. The same is surely true for possible economic, mental or physiological effects of solar change: they are probably felt in a small degree, but are like raindrops on the ocean compared to the other driving forces of our lives. It is my guess that the droughts and stock-market decline of the early 1970s were only indirectly or accidentally related.
X-ray shot of corona: turquoise and yellow areas indicate sunspot regions; the black 'Boot of Italy' is a hole in the corona.

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to falling action on the sun, for we do not find the same effects following sunspots so regularly in the longer history of the sun.

There is, I think, an important exception. It is seen when we step back and look not at weather but at longer-term climate changes, and when we examine not the 11-year sunspot cycle but the longer-term shifts of character of the sun. Recently, we have found that the overall level of solar activity has changed in drastic and surprising ways, and in the not-too-distant past. If the sunspot cycle is a ripple, these longer-term changes are tidal waves. One—a 70-year absence of sunspots—took place only 300 years ago. And at that time the whole world’s climate shifted sharply colder.

We have found evidence of about a dozen other solar changes that have taken place since the time of the Egyptian pyramids, and they all seem closely associated with climate shifts. We think we are in the midst of one right now—not a low, but a long-term high in solar action that, perhaps, is related to a long-term warming of our world climate. That’s the good news. And it may mean that we are close to being able to predict long-term climate change on Earth.

How will television, and CB radio, be affected by sunspot changes in the next few years? Assuming that the present strange minimum in sunspots is almost over, we can expect a marked increase in solar action between now and about 1980, and in that time TV reception will change. If you are in a fringe area, and don’t have a good directional antenna, your reception of the lowest-frequency channels (2, 3 and maybe 4) could at times be blurred by interference from distant stations that use the same channel. The interference should be no worse, and probably less, a problem than it was during the last sunspot maximum in 1968-1970. Do you remember any marked differences in TV reception during those years? I don’t and few probably will, for changing solar activity has only minor effect on most of the very-high-frequency TV bands.

CB radio, at somewhat lower frequencies, is another thing, and as solar activity builds in the next few years the sun’s behavior will be noticed. CB sets will begin picking up really distant stations and the CB channels will at times get a lot more crowded.

As for the sun, I suspect that it doesn’t care, one way or the other.

Gas loops connect the various sunspot regions: arc high enough for the Earth to roll underneath. Yellow blob in foreground is part of a region containing sunspots.

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