

Science You Can Use

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Dear Science: Can the alignment of the planets influence human affairs? -- Buck R.

Dear Buck: Before we can answer, we need to be clear what question is being asked. There are two general possibilities. The first comes from astrology, which holds that various alignments of celestial bodies affect human feelings, interpersonal relationships, success in business, etc. The second meaning comes from astrophysics, which can tell us whether the alignments of celestial bodies can have a material effect on human activities. Let's look at these in turn.

The astrological question. Among other things, astrology claims that certain alignments of the planets with each other or with respect to the background of stars can have profound effects on human affairs. Despite the popularity of astrological "predictions", astrology is, from the scientific point of view, just nonsense. There are several reasons for this.

First, the claims of astrology are typically so vague that we cannot, even in principle, describe an experiment that could be used to help determine whether they are true. For example, "You will meet someone who will change your life" doesn't tell us when such an event will occur. Moreover, the claim doesn't tell us what counts as "changing your life". There is a sense in which everyone with whom we interact changes our life, because interacting with anyone is trivially different than interacting with no one. And if that is all that is meant by "changing your life", then trivially, you will almost surely meet someone on any given day who will "change your life".

Second, astrology doesn't explain anything. "John is a Cancer (zodiac sign), so he is incompatible with Kate, who is a Libra", doesn't tell us why John and Kate won't get along. If you ask an astrologer why Cancer and Libra are incompatible, he or she will tell you simply that Cancer and Libra are incompatible. But that is not an explanation – it's just begging the question.

The astrophysical question. Some planetary alignments can have profound material/physical effects on human life. One has recently made scientific headlines. First, a little background.

The Sun goes from a phase of minimum, to a phase of maximum, then decreases back to a minimum, activity over a period of approximately 11 years. The peak of solar activity in this cycle is called "solar max"; the minimum, "solar min". This activity is typically associated with the number of sunspots – visually "dark" patches -- on the solar surface. Activity (and sunspot count) is maximum at solar max and minimum at solar min.

Activity near solar max can disrupt the functioning of Earth-orbiting navigation (e.g., GPS satellites), communication, and observation resources (such as weather and spy satellites).

In addition, charged-particle ejections from the Sun happen relatively frequently at solar max. In 1989 (which was a solar maximum), a large charged-particle ejection from the Sun heavily damaged a large transformer in the Hydro-Quebec electricity transmission system. All of Canada briefly went dark. The damage could have had far more serious consequences than it did. The transformer was part of a system that provided peak-power support for New York City during the summer air-conditioning season. Typically, a transformer of this kind is not kept in inventory, and it takes about six months from order to delivery. By pure accident, there was a spare in inventory. Had it not been, New York City would not have been able to meet the conditioning demand during the summer of 1989. Many buildings in New York do not have windows that open and are uninhabitable without air conditioning.

What does the solar cycle have to do with planetary alignments? Astronomers have long known that the solar cycle happens to coincide with the alignments of Venus, Earth, and Jupiter. Until very recently, it was widely assumed that fluctuations characteristic of those seen during the solar cycle are so large that they could be driven only by the movement of mass in the Sun's interior. Even the combined gravitational force of Venus, the Earth, and Jupiter is far too small to affect the stability of the solar interior. Most astrophysicists, therefore, regarded the coincidence of the planetary alignment with the solar cycle as "just" a coincidence.

Using simulation, a group of physicists at Helmholtz-Zentrum Dresden-Rossendorf, an independent German research institute, has recently provided a compelling argument that the Venus-Earth-Jupiter alignments does play a major role in "clocking" the cycle.

Here's a short version of that story: Venus-Earth-Jupiter alignments trigger a recurring instability at the solar surface. We can think of this behavior in terms of an analogy. Suppose we stretch a rubber band between, and near the top, of two pegs, then flip one end of the band off the post. It takes relatively little energy to release ("trigger") the relatively much greater energy stored in the stretched band. The trigger is not the source of the energy released by the band, but it does determine ("clocks") when the band's energy is released.

For further information, see <https://dailygalaxy.com/2019/05/suns-11-year-cycle-powered-by-tidal-forces-of-venus-earth-jupiter/>.

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Jack Horner is a systems engineer. Thanks to Tony Pawlicki for suggesting the topic.