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SCIENTISTS MEET TO GRAPPLE WITH PROBLEMS OF ANCIENT, CHANGING SUN

What has the Sun been up to lately? More than 100 scientists will meet at a "Conference on the Ancient Sun" in Boulder, Colorado October 16-19 to try and find out.

The mystery of the Sun's past is more than just a scientific detective story. What the sun did millions of years ago may give us clues to what it will do in the future--especially what it will do to our weather, climate, and agriculture in the generations ahead.

The Conference comes at a time when there is more and more new evidence that the Sun is not the constant, unchanging star we once thought it was. Minor variations in the Sun have been known for some time (for example, the familiar 11-year "sunspot cycle"). But recent studies of materials as different as tree rings and historical records show longer ups and downs for the Sun. These new data "suggest that the Sun over long timescales is intrinsically a variable star," according to Dr. John Eddy of the National Center for Atmospheric Research (NCAR) in Boulder.

Piecing together the record of the Sun's past will be a tough job for the scientists at the Conference, for the evidence is scattered like the pieces of a jigsaw puzzle through an amazing variety of terrestrial and extraterrestrial materials--historical records, tree rings, ice layers in the polar caps, deep-sea sediments, meteorites, and moon rocks. Some of these samples have recorded the Sun over periods of years or centuries; others contain traces that may go back to the birth of the Sun 4½ billion years ago.

The record available on Earth spans only a tiny fraction of the Sun's lifetime. Human historical records trace the Sun's variations back for about 600 years. Traces of radiocarbon (Carbon-14) trapped in ancient tree rings provide data from the past 8,000 years. Even older materials--ice from the polar caps and cores of sediment from the bottom of the sea--cover only about 500,000 years, or about one-ten-

thousandth of the total lifetime of the Sun.

Scientists can now trace the Sun even farther back in time, thanks to our recent explorations in space. A record of the Sun that goes back millions, perhaps billions of years is now being extracted from meteorites and from samples returned from the Moon. These rocks have trapped and preserved actual atoms ejected from the Sun by its "solar wind" and by the great "solar flares" that erupt periodically on the Sun's surface.

"Specimens of moon rocks and meteorites now in our laboratories contain real pieces of the Sun," says Dr. Bevan M. French, Dicipline Scientist for NASA's Planetary Materials Program. "We have samples of what actually came out of the Sun in the past, and we may now be able to construct a record of the Sun's life that extends millions or billions of years back--perhaps even back to the formation of the Sun 4½ Billion years ago.

With the Sun as a central focus, the Conference is bringing together scientists from many different fields to exchange data and to improve communications among widely-scattered specialists. "Many specialists in solar physics, astronomy, and planetary science are really working toward a common objective: to understand how the Sun has behaved through time," says Dr. Robert Pepin of the University of Minnesota in Minneapolis, who with Dr. Eddy is co-convenor of the Confernece. "But communication among scientists in different research fields is often not very good. There will be participants at the Conference who will meet and hear each other for the first time, even though they have been working on the same general scientific problem for years." Theorists will review and update today's uncertain models about how the Sun works and why its behavior changes with time. Astronomers will discuss current knowledge about the Sun and about the billions of Sun-like stars in our universe. Climatologists will tell how the data obtained from tree rings and ice cores are related to the possible role of the Sun in controlling past climate changes on earth. Planetologists will try to decide whether the Sun is responsible for major climate changes observed on Mars. Geologists studying moon rocks and meteorites will describe how a record of the Sun's early years has been preserved in these unique extraterrestrial materials. Review papers,

discussions, and displays make up a large part of the Conference program.

Some studies of the ancient Sun will take the Conference outside the Solar System itself. Variations in the magnetic strength of the Sun also control how strongly the Earth and Moon are bombarded by cosmic rays, the strange high-energy atomic particles born in great explosions elsewhere in our own Milky Way Galaxy. These particles have left their traces in moon rocks, in meteorites, and in the radiocarbon deposited in the rings of old trees. These special samples contain an important dual record: a history of our variable Sun combined with actual, though minute, samples of matter from other parts of the Galaxy.

The "Conference on the Ancient Sun," a Lunar and Planetary Institute Topical Conference, is sponsored jointly by the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), the National Center for Atmospheric Research (NCAR) at Boulder, Colorado, and the Lunar and Planetary Institue (LPI) in Houston, Texas. For further information contact Pamela Jones, Lunar and Planetary Institute, 3303 NASA Road 1, Houston, Texas, 77058, telephone 713-486-2150.

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