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Of the Week

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COVER: Technological man has long wished to have the energy from the sun in his grip. Solar energy has been neglected in the United States for economic, not technological reasons. The situation may be changing. See p. 242. (Illustration: Ann Beyer Lunsford)

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COMMENT

Our new view of the solar system

The solar system will never be the same. In an interval of less than four months, from December through March, Jupiter, Venus and now Mercury have all been visited by spacecraft that have sent back across millions of miles of space the first close-up photographs of the three planets and enough new data to keep planetologists busy for years.

You can imagine the coming scramble to revise old textbooks on astronomy and rapidly to prepare completely new ones. All undoubtedly will be graced by the striking new photos of the planets, courtesy of Pioneer 10 (for Jupiter) and Mariner 10 (Venus and Mercury).

Visually, the Mariner 10 views of Mercury represent an enormous leap forward in knowledge. It will be hard to remember that until March 29, 1974, the best photographs we had of Mercury, taken by earth-based telescopes, showed little more than a fuzzy white crescent with a few irregular gray smudges. In one swift pass by the planet, Mariner 10 has changed all that. Now we have those magnificent views, as seen on the cover and inside pages of last week's issue, of a crater-riddled surface, apparently subjected to much the same degree of bombardment over the eons as earth's moon.

Mariner's instruments have discovered that Mercury has an atmosphere (it's thin, and primarily of helium, but it is still an atmosphere) and a magnetic field. The magnetic field is weak, but it is nevertheless a surprise on a planet whose 59-day rotation period is seemingly too slow to generate one by the dynamo action of an electrically conductive core. Mercury seems to have a heavy earthlike core enclosed by a lighter moonlike surface. Planetologists interested in the origin, evolution and comparative geology of the planets are thinking hard about what that all means.

As a warm-up to its main performance at Mercury, Mariner 10 flew past Venus in February and sent us some remarkable views of weather and climate systems on the planet. Ultraviolet photographs show vast bands of cloud structure spiraling poleward from the mid-latitudes, apparently shaped by high-altitude winds that rage across the planet at 100 meters per second. Then there's the Venusian Eye, a turbulent atmospheric convection cell roughly the size of the United States that plows through the rest of the atmosphere to maintain its position near the point at which the sun's rays fall perpendicularly on the clouds.

And who will be able to forget the magnificent photos of Jupiter, the kingpin planet of the solar system, transmitted to earth in December by Pioneer 10, which narrowly survived its encounter with Jupiter's powerful, 10-million-mile diameter, tilted, upside-down magnetic field? Some of the photos reveal interesting, never-before-seen features in the planet's atmosphere. Jupiter is proving to be of ever increasing interest to scientists in fields ranging from physics and meteorology to chemistry and, yes, biology. Its atmosphere could prove to be, in part, a cauldron of organic molecules, the site of the synthesis of a prebiotic organic soup. Pioneer 10 data reported in this week's issue indicate surprisingly warm temperatures in parts of the Jovian atmosphere. Planetologists are excitedly assessing the implications.

All in all, the feats of Mariner 10 and Pioneer 10, together with the earlier orbital mission of Mariner 9 around Mars in 1972, are a triumph of instrumented planetary science. As noted in this space last November, we are right in the middle of an extraordinary period in history when the planets of the solar system are for the first time being opened up to close-up observations. The successes of Mariners 9 and 10 and Pioneer 10 speak well for the skills and knowledge of the scientists and engineers involved in the unmanned planetary space program. If Pioneer 11 (to reach Jupiter in December 1974), the Viking Mars landers of 1976, the Jupiter-Saturn flybys planned later this decade, and other space missions on the drawing boards for the 1980's (SN: 3/9/74, p. 162) are similarly fruitful, the major planets of the solar system will within 15 years have become nearly as familiar to us as our own earth.

The beneficial effects this will have on the geophysical sciences will be enormous. We will be far better able to understand processes on the earth, for example. But the philosophical ramifications in expanding our interests and concerns beyond the boundaries of the earth to the solar system as a whole will perhaps have even wider impact.

—Kendrick Frazier