merican Association for the Advancement of Science was founded in and incorporated in 1874. Its objects are to r the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promo- f human welfare, and to increase public understanding and appreciation of the importance and promise of the ods of science in human progress. Postmaster: Send Form 3579 to SCIENCE, 1515 Massachusetts Avenue, NW, ington, D.C. 20005.

COVER

Color mosaic of Viking 1 Orbiter pictures. Fifteen frames taken through three color filters (violet, green, and red) were reconstituted by the U. S. Geological Survey, Flagstaff, Arizona. The scene covers approximately 1800 by 2000 kilometers and contains part of the "Grand Canyon of Mars" (*Vallis Marineris*). The Viking 1 landing site is north of the scene. See page 97.

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A New Window on Our Planet

Space research is yielding an increasing body of new knowledge and practical applications. Conspicuous examples are the results from the Vikings and the success of communications satellites. Yet an important multidisciplinary, multinational series of global studies is receiving little notice. The enterprise was born 23 July 1972 with the launching of the first Earth Resources Technology Satellite (ERTS-1) by the National Aeronautics and Space Administration. Since that time, most of the solid earth has been imaged, much of it repeatedly, and scientists and engineers have been exploiting the data. Some of their findings are displayed in a recently published professional paper* of the U.S. Geological Survey which contains about 90 articles on eight major topics, including applications to cartography, geology and geophysics, water resources, land-use mapping and planning, environmental monitoring, conservation, and oceanography.

Utilization of data from ERTS-1 has been widespread. Some 100 nations are participating. Application to cartography and geology and geophysics are numerous. This was evident at the International Geological Congress in Sydney, Australia, during August 1976.

ERTS-1 is in a near-polar orbit about 918 kilometers above the earth. It circles the earth every 103 minutes and views each area of the earth every 18 days. ERTS-1 obtains images in four bands of the spectrum—0.5 to 0.6, 0.6 to 0.7, 0.7 to 0.8, and 0.8 to 1.1 micrometers. Data from the images can be combined to produce false-color pictures or can be analyzed by computer.

A particular advantage of ERTS-1 is the periodic coverage. Images obtained at different times can be compared and short-term or long-term changes evaluated. For example, variations in the chlorophyll content of fields can be detected. Healthy plants contain more chlorophyll than sickly ones. Thus, information on crop prospects can be garnered. The images also show the extent of forests. By comparing winter and summer data, the abundance of deciduous trees can be established. Yet another example is in management of water resources. In many areas of the world, regulation of reservoirs fed by melting snow is vital. By studying successive ERTS images and related ground data, better management is possible.

Longer-term periodic coverage may prove to be particularly important. One of the chapters of the USGS professional paper is devoted to the mapping of Antarctica, especially its coastal areas. The images will be part of a historical record which will show changes in the size, shape, and position of such features as ice shelves, glaciers, and ice tongues. With continuing monitoring of such features, ERTS-1 or its successors may well provide the first substantive indication of global climatic changes.

Another important advantage of the ERTS system stems from the height at which the satellite moves. Thus, an image covers an area of 34,000 km^2, about 1000 times that covered in an aerial photograph from a high-flying plane. In consequence, large-scale features of the earth have been identified that had previously gone unnoticed. Of particular importance to economic geology is the discovery of large-scale linear and curvilinear features.

Scanning the articles in the USGS publication, one can find evidence that the ERTS-1 venture is more than a simple exercise in photography whose potential will be quickly exhausted. It is clear that in 4 years scientists and engineers have found many other uses for the data. Moreover, with experience the power of the applications has increased. For example, images obtained from rocky terrain tend to appear as only slightly varied shades of gray. However, with electronic data processing, it becomes possible to identify the delicate shades as different rock formations.

The scientists using the ERTS-1 images are enthusiastic. Many feel that such satellites will be of great help to all nations in coping with natural resource and environmental problems, and that the ERTS data could not have become available at a more propitious time.—PHILIP H. ABELSON

*R. S. Williams, Jr., and W. D. Carter, Eds., "ERTS-1: A new window on our planet," *U.S. Geol. Surv. Prof. Pap. 929*. (Government Printing Office, Washington, D.C. 1976). Paper, $13.