ENVIRONMENTAL/ENGINEERING GEOLOGISTS—DINNER MEETING OCTOBER 26, 1988

DAVID L. AMSBURY—Biographical Sketch

David Amsbury is currently Staff Scientist in the Space Shuttle Earth Observations Office of NASA at the Johnson Space Center in Houston. He was born in Topeka, Kansas, and attended Sul Ross State College in Alpine, Texas, where he received a BS degree in geology in 1952. In 1957 he received a PhD in geology from the University of Houston at Clear Lake.

Dr. Amsbury was employed by Shell Development Company in Houston from 1955-1965, where he performed detailed stratigraphic studies on Lower Cretaceous rocks of Central Texas. During 1966 he was transferred by Shell to Denver, Colorado, to study the Tensleep Sandstone.

Dr. Amsbury joined NASA's Johnson Space Center in 1967 as an Aerospace Technologist and Geologist in the Earth Resources Division. He served as scientific advisor in the general field of applications of spacecraft technology and the Earth Resources Aircraft Program to petroleum and mineral exploration. Other duties included research on geological applications for small-scale aerial and spacecraft photography, and in addition he served as Team Leader in Geology and Technical Monitor of the Skylab Earth Resources Experiment Package for geological investigations and international agreements.

During 1975 at NASA, Dr. Amsbury became Project Scientist, Forestry and Range Applications. He utilized remote-sensing methods to determine the effects of landforms, soil types, etc. on vegetation inventory, range and forest productivity, and strategies of resource management.

Dr. Amsbury accepted his present position in 1985 as Staff Scientist, Space Shuttle Observations Office and is now responsible for geological applications of astronaut photography of Earth, and remote-sensing technology, such as the Large Format Camera and the Shuttle Imaging Radar.

He earned the JSC Special Achievement Award in 1983, as well as numerous other awards and honors.

Dr. Amsbury taught courses at the University of Houston from 1970 to 1986 in photogeology, energy resources, natural resources and society, environmental impact statements, environmental geology, remote sensing in geology, stratigraphy, geology of carbonate rocks, and geowriting.

TRENDS IN REMOTE SENSING FOR ENVIRONMENTAL GEOLOGY

The field of remote sensing today contains a bewildering array of techniques and applications. The spectrum of techniques ranges from field work using black-and-white aerial photographs or oblique low-altitude color slides, to digital manipulation of data transmitted from space-borne imaging spectrometers and radars. And the spectrum of applications ranges from selection of the best site for construction on a given tract of real estate, through monitoring the health of crops and native vegetation, monitoring of compliance with environmental laws and regulations, aspects of petroleum and mineral exploration, and estimating the effects of human activities on regional drainage networks, to documenting regional and global changes over decades. Digital data bases that allow pixel-by-pixel comparison of geographically-referenced data from many sources are becoming commonplace and are relatively easy to use on desk-top systems.

An environmental geologist faced with this array of techniques and applications must decide, more critically than ever, what he or she is really trying to do. What is the time and money being spent to accomplish? Who will use the results, and for what? Only then can rational decisions be made about questions such as:

- Spatial or spectral data?
- Analogue or digital data, or a mix?
- Acceptable costs for acquiring, extracting, arranging, and presenting data and information
- The most effective use of field work
- How many copies of the report should be prepared, and who gets them?

The role of NASA in general, and the role of the Johnson Space Center in particular, has not been aimed at helping a resource manager or an environmental geologist do a job. Rather, the role has been and remains one of research into new techniques and applications. Once a technique or application nears the development stage — perhaps long before commercial operation is possible — NASA turns the research over to another government agency and/or to private industry. During the 1960s NASA research explored potential civilian applications of military reconnaissance techniques: for example, color-infrared film ("camouflage-detection film") to monitor crops and wildland vegetation, thermal-infrared imaging for tracking water masses, and side-looking radar imagery for mapping topography and geological structures.

The 1970s saw the development of spaceborne sensors that were designed for civilian applications. The ERTS/ Landsat system, launched in 1972, brought forth a whole new industry of digital processing and analysis of geographically-referenced data. Not incidentally, the satellites also provide maplike black-and-white and color-infrared imagery at a 1:1 million scale. No doubt the overwhelming use of the data so far has been as a substitute for regional photography. The need for digital data bases sparked much research, at first using main-frame computers. Skylab, America's first space station (1973-74), provided relatively high-resolution returned film from multispectral and color-corrected cameras, data from imaging and non-imaging spectrometers, and non-imaging radar data at multiple wavelengths. Airborne imaging spectrometers that operate at a dozen or more wavelengths and provide high spatial resolution were under development by NASA; airborne synthetic-aperture radars became available commercially.

Remote-sensing systems continue to proliferate in the 1980s. Several countries operate Landsat-like systems, and airborne imaging spectrometers, thermal imagers, and radars are used routinely for commercial and government applications. Sophisticated, geographically-referenced, digital, data-base management systems reached the desktop. The Soviet Union has maintained a manned space station for several years; engineers and scientists aboard continue to experiment with procedures for observation of natural resources, multispectral photography, mapping photography, and multispectral digital imagery. The United States utilizes the Space Shuttle for manned observations, hand-held color photography, mapping photography, and imaging radar experiments. NASA plans to extend applications of the Shuttle to a manned space station, and to extend unmanned data collection into a global Earth Observing System during the next decade.

So where does this bring the environmental geologist? To a huge warehouse that contains everything from glittering new electronic gear to obsolescent war-surplus equipment. The directions for using this stuff may exist only in the gray literature, or in "personal communication". The diversity of equipment and techniques requires much discrimination by the user in selecting appropriate — and cost-effective — tools for a task. Jobs, both paid and voluntary, are all around us in the field of remote sensing. But in addition to the technical task of selecting the best tools, problems can arise in 1) the difference between an employer's perception of needs, and the geologist's; and 2) the legal admissibility of seemingly exotic remote sensing data. The overall trends are toward more kinds of sensing systems throughout the electromagnetic spectrum, and to more-complex data-manipulation techniques driven by inexpensive megabytes. Environmental geologists will have to be technically innovative while maintaining scientific and ethical rigor.