the support systems in place with the technology make it abundantly clear that graphics has arrived as a prime tool for the explorationist.

Today we will examine factors associated with the use of graphics and graphics technology. First, we will review the technology evolving in computer graphics and comment on what impact and value technology has on the graphics products of today and what future trends can be projected. Second, we will discuss the techniques and philosophy of the software support systems. We will look at some of the earlier frustrations of graphics systems and examine the easier-to-use systems available today. Third, we will examine some of the economics associated with graphics systems and discuss trade-offs and alternatives available to the industry. Fourth, we will discuss some of the personal and personnel factors associated with the use of graphics and graphics technology.

The summary will bring together the four points mentioned above to show that it has taken an evolution and a change in all of these factors to provide the current environment where graphics can provide a really productive tool for the progressive explorationist.

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GIMMAP—An Interactive Computer Cartography System

Computer-produced contour maps with postings of data points and optional perspective views for surface representation are widely recognized as valuable tools in oil exploration, seismic studies, ground-water modeling, and other geologic applications. Few, in any, of the myriad contouring packages are designed to provide an accurate background of cartographic information to help the scientist, engineer, or politician relate contoured information to the real world of political boundaries, highways, and river beds. Additionally, there is much information of interest (e.g., geologic contacts) which cannot be contoured, but which must be treated as pure cartographic information. The GIMMAP (Geodata Interactive Management Map Analysis and Production) system, developed jointly by the Kansas Geological Survey and the Bureau de Recherches Geologiques et Minieres (France), is being used to produce such background maps as well as traditional multicolor geologic maps. The U.S. Geological Survey 7.5-minute topographic series is used as the primary input source for construction of a cartographic data base consisting of political boundaries, surface hydrology, the transportation network, and U.S. Land Survey information (township-range-section). Additional features may be digitized or projected from latitude-longitude coordinates as required for special projects. GIMMAP employs interactive techniques to assist graphical editing of linework; relative definition, editing, and coloring of areal features; placement and editing of symbology; and versatile, user-specified retrieval for producing plots or high-quality scribes for color separation. The modular FORTRAN package relies on physical and logical data segmentation and extensive use of random-access files to operate on a (64 K byte) minicomputer.

SCHETTER, W. C., and R. A. BASSE, Exxon Co., USA, Denver, CO

Normalization of Well Log Data for Regional Stratigraphic Analysis

The normalization of well logs is a recognized technique for the removal of instrument and sensitivity errors. This paper describes a project which used logs from 240 wells that penetrated Upper Cretaceous rocks in the Powder River basin of Wyoming. Normalization of the gamma ray, density, and conductivity curves was accomplished by adjusting each curve to a trend surface for the project area. Examples before and after normalization will be shown and alternate methods are discussed. Processing and problems, data flow, and tabular results of discriminant analysis of the normalized log digits are discussed. The discriminant analysis relates to the evaluation of geologic models established for the Sussex and Shannon formations.

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Seismic Modeling with an Apple

Seismic stratigraphy is one of the most fascinating and complex aspects of geoscience. The complexity arises from the profound formulas and numerous variables used to model earth algorithms. In this aspect the microcomputer, when equipped with appropriate seismic modeling software, has proven itself, in the Michigan basin, as an extremely useful tool to discern and depict seismic response.

STARK, P. H., JIM FITZGERALD, and LARRY WILCOX, Petroleum Information Corp., Denver, CO

Interactive Synthesis of Geological Data for Exploration in Frontier Provinces

The successful integration of interactive graphics systems with data base management and application systems is a major challenge for the 1980s. In the past ten years, developers of computer systems have introduced stand alone systems for seismic processing, petrophysical analysis, and interactive drafting/mapping and graphic display systems. Separate data base management systems with applications for large industry files such as well and production data have evolved. The integration of multiple large data files with user friendly data base management systems has received great attention, but has not been solved. The challenge can be met through the cooperative effort of data base specialists, interactive graphics specialists, and users.

This paper describes a data management system that was developed to provide interactive applications using geological and geophysical data to evaluate the National Petroleum Reserve, Alaska. The system permits interactive online retrieval from multiple data files and interface to application programs that feature graphic displays. Examples show the results of integrating multiple data files with graphics output. Included are: (1) seismic combined with well data and digital base map for subsurface geological mapping; (2) geochemistry combined with bore hole logs, a stratigraphic section, and lithology; and (3) paleontology combined with lithology and a stratigraphic section.

The system also accommodates other geological data such as surface geology and petrographic analysis. This system supports the user by featuring geological data management and applications with graphic displays using electrostatic plotters. The user will be additionally rewarded when this capability is merged with interactive CRT graphics systems.