nature the most salient trend in geophysical exploration has been one toward full utilization of the available data. Modern data processing equipment and techniques of analysis are being introduced while theoretical studies attack seismic stumbling blocks like multiple reflections, ghosts, diffractions, and scattering.

The vistas of innovation opened by digital recording and processing spurred several operators to intensive study of the possibilities and the cost picture of digital methods. The use of seismic energy sources other than conventional dynamite explosions is increasing, as are special shooting techniques aimed at ghost elimination. Synthetic seismograms from continuous velocity logs are being brought to bear increasingly on stratigraphic problems; inverse convolution techniques seek to reconstruct the CVL from better quality seismograms while research on synthetic seismograms continues at a high level.

Applications of the rubidium vapor magnetometer have been reported both in exploration for minerals and for oil. The accuracy of the airborne gravimeter has been improved, but is still insufficient for exploration purposes. The shipborne companion instrument is in use as an exploration tool.

Existing well logging methods have undergone further development with modern methods of electronic data processing being applied increasingly. A new logging technique, nuclear magnetism logging, promises to give an indication of porosity above a certain pore size. The attenuation of the signal in acoustic well logging is being used to locate fractures and to evaluate cement bondings.

There is a new interest in natural electromagnetic fields and the degree of coherence between electric and magnetic field components.

Several of the projects sponsored by Vela Uniform, the U. S. Government Project created to achieve adequate detection of underground nuclear blasts by the U. S. Atomic Energy Commission and other agencies, have exploration potential (e.g., long seismic and electrical profiles, theoretical studies, certain instrumental developments).

Academic research in all branches of geophysics is active, with major benefits deriving from modern data handling techniques, and the new defense interest in the earth sciences providing many opportunities.

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Use of the Vertical Profile in Environmental Reconstruction

The relation of the vertical stratigraphic succession to areal depositional patterns was first observed by Johannes Walther and is known as Walther's Law of Facies. Each depositional unit in a vertical stratigraphic succession is the result of a particular sedimentary environment. When these units are compiled vertically, they represent a sequence of environments characteristic of a specific over-all sedimentary process such as regression or transgression. These environmental successions are definite and recognizable and may be used to define over-all sedimentary processes in ancient rocks. Therefore, environmental sequences provide a reference framework for interpreting the sedimentary history of any stratigraphic section.

Only a limited number of specific vertical sequences has been found in a comparative study of Recent and ancient sediments. The following sequences have been developed into models of sedimentation.

Regressive Marine

c. Marine shale or lagoonal deposits
b. Thin-bedded sand/silt and shale
a. Poorly bedded shale

Lowermost units are deposited below wave base; higher units close to sea-level.

Fluvial (channel or valley-fill sequence)

d. Ripple cross-laminated zone
c. Laminated, even-bedded sand/silt zone
b. Festoon cross-bedded zone
a. Basal conglomeratic bedload zone

Deltaic Sequences

Regressive marine sequences overlain by nearshore fluvial, bay, and marsh deposits; characterized by extensive marine deposits and variable non-marine sediment distribution patterns.

Transgressive Marine

b. Marine shales or fragmental limestones
a. Sand or silt

Widespread distribution and thinness are diagnostic; basal unit abruptly overlies shale in many instances; gradation upward into marine shale is rapid.

Bathyal-Abyssal Sediments

Widely distributed, thin-bedded; fauna and sedimentary structures characteristic of deeper water.

Lacustrine Sediments

Resembles regressive marine sequences, but is developed on a smaller scale and lacks marine fauna.

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General Tectonics and Paleozoic Stratigraphy of the Delaware Basin of West Texas

The pre-Morrow sediments of the Delaware basin were deposited uniformly over a cratonic shelf in a marine environment. During early Morrow time an orogenic movement began which reached its zenith during post-Morrow time. The area was severely eroded and peneplaned. During Strawn and later time, the area began to subside with definite depositional troughs forming. Generally, four facies were deposited simultaneously—the arkose and conglomerate facies on the flanks of the highlands, the lagoonal facies of light-colored limestones and shales in the marginal areas, local reef type or carbonate buildup facies, and the dark-colored basinal facies of limestones, shales, and sands. In some locales, the carbonate buildup facies tended to separate the lagoonal from the basinal facies. These conditions persisted until late Wolfcampian-early Leonardian time.

At this time, the area experienced a broad epeirogenic movement. This movement resulted in a change of regional strike and in many areas resulted in a change in the nature of the sediments being deposited. The sea, during Leonardian time, reached its maximum extent, and for the first time since pre-Morrow time, completely inundated the area. A well defined, barrier type reef developed which separated the light-colored lagoonal facies from the dark-colored basinal facies.

The sea began to recede by late Leonardian or early Guadalupian time. Reef growth continued until Ochoan time when an evaporitic basin was forming due to further restriction of the sea. The basin continued to subside as the continent emerged, resulting in a thick evaporite sequence. The end of the Permian was marked by the advent of the Triassic redbeds filling in the basin. This was followed by the complete uplift of the area during late Triassic and Jurassic time.