and geochemistry—are of special concern to explorationists of the petroleum industry. Institutions trying to train students for future professional work in the earth sciences are confronted with difficult educational problems. Certain of the more important and critical of these problems are discussed.

The student who is to become the imaginative and successful explorationist of the future must know the fundamental facts and principles of the earth sciences. He must know how to do field work, for exploration is still a combination of field science and art, but he must also understand the place of theory and experiment, of laboratory investigation and careful measurement. He must know enough mathematics to understand the laws and principles of physics and chemistry, so that he is reasonably knowledgeable about the work of his earth science associates. And he had better be able to speak clearly and forcefully, to write succinctly and to the point, and to press or yield as occasion demands when dealing with situations or people.

This is a big order to fill. It will hardly ever be filled by any single person. Assuming nevertheless, that we should attempt to train the best possible earth scientists, even though few will approach the specifications given, how shall we solve the problems now with us which bear directly on this question?

Should we go to a five-year program for a bachelor's degree, and correspondingly increase the time necessary for more advanced degrees? How many bachelors, masters, and doctors should we train? Is there a possibility of an oversupply in the coming decade? How can some of our best younger scientists be attracted into the earth sciences? How can the ambitious and capable ones without adequate funds get financial help? Can the best professors, especially the younger ones, afford to continue to be professors, in the face of more inviting positions in industry? How can the great Ph.D.-producing institutions maintain quality in staff and students in the face of inflation? Should the petroleum industry support educational effort even more generously than at present and possibly share some of their abler scientists and engineers with educational institutions? Finally, should the endowed institutions look to increased federal support?

Early Prospecting in West Texas Permian Basin (1919–1925)

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Interest was drawn to West Texas Permian basin by discovery of oil in the Bend formation at Ranger in October, 1917.

Stratigraphy of the area as understood by geologists of that day was discussed in Bulletin No. 44 of the University of Texas.

In an unpublished opinion, J. A. Udden thought that the Marathon folding would have a northeast expression in Reagan, Glasscock, Sterling, and Mitchell counties.

The discovery well of the Westbrook pool in Mitchell County was completed at approximately 2,500 feet in the early part of 1921 in a limestone pay of lower Double Mountain age.

The Big Lake pool was discovered by the Texon Oil and Gas Company's University No. 1, which found 50 bbls. of oil in the Big Lake limestone (lower Double Mountain) from a depth of 3,600 feet.

Subsequent wells showed the east side of the basin to be a rather featureless monocline, very much as it appears today.

In 1925 little was known about the central part of the West Texas Permian basin. There was some meager evidence of the existence of the West Texas structural platform as follows: the northwest-southeast alignment of the Cretaceous escarpment extending from King Mountain in Upton County northwestward across to Ector County; rolled Edwards fossils in caliche hills of western Winkler County; possible Triassic inliers in Crane and Ector counties; shallow salt in northwestern Crane County; Big Lake limestone found in Cordona Lake Company's (Texas Development) Cowden No. 1 in southwestern Crane County at 112 feet, as compared with the Wentz Oil Company's Bryan No. 1 central Midland County, which found Big Lake limestone at 1,540 feet, indicating a fall on the Big Lake limestone in a northeastern direction of 1,700 feet in approximately 40 miles.

Recent Developments in Geophysics

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The search for oil is based on the correlation process. One core is compared with another; one well log is matched against another; a seismic trace is correlated with the adjacent traces; and a seismic record is correlated with the adjacent records. The correlation process should be examined more closely. In the last few years. the process of correlating a well log with a seismic reflection record has been greatly improved. The improvement has been accomplished by changing the presentation of the well log so that, in its new form, the well log data are more comparable with the data on the seismic record. In other words, the well log curve has been filtered and redrawn to the seismic time scale. This process of filtering and changing the scale can be used in correlating one well log with another.

In the process of correlation, the manner of presenting the data is most important. Because of recent improvements in seismic instruments, it is now much easier to make seismic record sections. A record section presents many data on a single sheet of paper; no data are omitted; and the data can be presented in various ways. This flexibility in the process of storing and reproducing data greatly facilitates the correlation process. Faults, uncomformities, steep dips, and unusual interference phenomena can be seen on a record section when they might not be seen in a study of separate seismic records.

Much of the present correlation process is subjective. The correlator merely decides that one wiggle looks like another wiggle. The process is not quantitative. It is possible to make a mathematical correlation between two curves. Because the use of magnetic tape is so well developed, it is now easy to build a computor to perform this mathematical correlation. The correlation of exploration data by means of a computer is new. At this time, the possibilities can not be evaluated.

Standards of Performance in Exploration

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Much has been written about increased finding costs for each barrel of new oil. Even greater attention has been devoted to the coordination of all phases of exploration. These problems can be stated simply, but perhaps our attempts at solutions have been too general.

"Standards of performance" are recognized as important tools in self evaluation and management evaluation of job performance. We believe these tools can be equally important to an exploration program. Their successful application will require substantial changes in initial planning, a precise statement of objectives, definite programs to overcome adverse factors, setting forth standards of performance, and establishing a timetable for periodic evaluation. A decision for geophysical work or the specifications of a geophysical field party is not made until these steps have been completed. If the evaluation warrants, a geophysical program is initiated. The timetable and standards of performance are constantly used to evaluate achievement of objectives. The program is terminated at any time objectives are not being realized.

Adherence to this plan will increase the probability of fulfilling stated objectives, or if this is impossible, will clearly indicate failure early in the program. In either event, more effective exploration results.