

SECTION B, GEOLOGICAL SCIENCES

What is Expected of a Geologist?

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The activities of a geologist about one and one-half centuries ago were not very definite. He was thought of by some as a stooped individual with a knapsack on his back, a pick in one hand and a magnifying glass in the other, crossing a wild terrain collecting specimens to go in a musty museum somewhere. The conventions of the American Association of Petroleum Geologists and the Geological Society of America the past year reported thousands of geologists registered. Many others, of course, were not in a position to leave their work to attend.

Perhaps you have heard many discussions of various professions, but you seldom hear of the activities of a geologist. Most of the time he is referred to as an oil man, mineralogist, paleontologist, stratigrapher, oceanographer, physiographer, vulcanologist, petrologist, or possibly a geophysicist, geochemist, geobotanist, etc. The field of geology is so broad that the average person chooses to specialize in only a few branches of it.

The geological profession is like all others in many ways in that it requires years of preparation and experience to meet the demands of industry, teaching and research. Geology is an earth science dealing with the history of the earth and its inhabitants. It calls upon the chemist to assist in the understanding of the rocks and minerals of which the earth is composed. The physicist directs our approach to the effects of heat, pressure and acting forces which bring about many changes in the internal and external materials of the earth. The biologist contributes much regarding the way in which plants and animals reflect the kinds of environments so important in sedimentation and how they serve as a basis for age determination and correlation of geological rock strata. The astronomer continues yearly to enlighten us regarding the very earliest stages in the origin of the earth and its relation to other celestial bodies. Mathematics is another precise tool for measuring the weight of one mountain against another or calculating the minute space relations between atoms in crystalline substances. The engineer may then take over and convert the crude and raw materials into power or commodities for better living while the medical men continue to increase the span of life for the human race.

Further, the geological profession is like all these named because it, too, requires a knowledge of the humanities. Some courses in the humanities are necessary to equip a young man for promotions into administrative positions in any industry. The education and training of a geologist not only sounds like a big order, but it is, if one is to become competent in the science of the earth. Those entering the university to major in geology and who ultimately choose that career, in many cases find that their transcripts show glaring high school deficiencies. Evidence supports the conclusion that much of the liberal education as well as the basic fundamentals of science can be attained in high school. Any high school student who expects to major in any science should study the university curriculum and be sure there are no high school deficiencies in mathematics, English, history, languages, etc. Further, no student of the sciences in the university can afford to neglect the humanities. Undergraduate specialization in high school or college may result in the training of a first-rate technician rather than a first-rate scientist and citizen. Most of the personnel men who conduct interviews for oil and mining

companies, stress the importance of fundamentals and basic courses in geology plus sufficient courses in economics, history, government, English, etc. for a complete education.

A geologist will advance much farther with his understanding of geology if he has had some basic training in allied sciences, such as chemistry, physics, mechanics, mathematics and biology. The reason for this is that most problems in geology are difficult to really visualize and solve without a comprehension of either or both physics and mechanics on the one hand and environment on the other. All phenomena, geologic or otherwise, depend upon environment as much or more than anything else. It is well to understand the importance of facies, both litho- and biofacies, and the many kinds of tectofacies; for facies in their every aspect are the result of environment. Ignorance or lack of appreciation of this simple fundamental fact is one of the main stumbling blocks in the understanding of oil or any mineral occurrence. This has cost the oil and other mineral extractive industries untold millions of dollars.

Regardless of the field of geologic interest, industry today expects the geologist to have a thorough grounding in fundamentals of the science. The fundamentals come first and trying to master the industrial applications comes later. Four or five years is not enough time to attain goals, but one can have the proper mental orientation at the end of the college career. The following basic studies are expected to best prepare the young men for industry. Such studies are the framework of the earth, particularly its crust, and the dynamic processes that affect the crust. Among these are diastrophism, meaning the rising and sinking of parts of the earth's surface, the various processes of basin development, the processes of sedimentation, the processes of igneous activity and the relations these processes bear to each other. It also includes fundamental knowledge of rocks and minerals and the relationship of all these to the dynamic geology of the earth's crust, temperatures, pressures and other environmental factors.

A sound geologic training must include a good historical perspective. It is not just the memorizing of geologic dates and names, but an understanding of the nature and significance of the processes in terms of crustal evolutions. Geological history has not been just a succession of recurrences or of unrelated phenomena. It has been a progression of events, that were as much related to each other and to succeeding geologic history, as anything in human history of the past few thousand years.

Since the majority of graduates in geology enter various phases of industry, the following question must be considered: "What does industry expect of a geologist?" There are those who may hold the view that industry is primarily interested in just how much of the subject matter one has retained from the college courses. If there are any such who hold this view, the remainder of this paragraph will disillusion them. That which industry will require of the individual depends much less than fifty per cent on the scientific and technical knowledge and more than fifty per cent on other qualifications. Let's consider first the latter. Industry expects a geologist to have a strong moral sense. Any company can train employees in any number of skills. However, a fellow's moral backbone is in a different classification. It is not something one can pick up as he goes along. He had better bring it along with him to the job. By the time one has completed the university studies he either has it, or should give first place to acquiring it.

The geological profession takes men and women into many varied fields of service. Over 15,000 men and women compose the geological profession in the United States. Over fifty per cent of them work for the Petroleum Industry. Many are employed by the federal government,

especially the United States Geological Survey. Other agencies such as the State Geological Surveys, the Bureau of Reclamation, Atomic Energy Commission, Soil Erosion Service, and the Bureau of Mines employ many more. Another large group of geological scientists serve on the faculties of colleges and universities. There are more than 200 departments in institutions of higher learning in the United States that employ from one to twenty-five or more each. Many in this group carry on research and often serve as consultants to state and national surveys, or to industry during the summer months. Several hundred American geologists and geophysicists are scattered through the world and have attained international reputations in science through their research work and the publication of its results.

Industry expects the young geologist to be trained to think. There is a lot of loose thinking in our national life today, and it may be displayed by men and women of all ages. So let's show our employer a college degree of intellectual competence rather than one merely of credit hours. The geological profession is one devoted to the "outdoors." Many work inside but the real data are collected outdoors, and just about all the thinking that goes with it is outdoors.

Industry is having to deal more and more with questions of human nature and these problems are not to be analyzed mathematically or solved with a slide rule. Many with oil companies are sent to foreign lands to operate. An employee is expected in some cases to learn the language of the country, and not to concern himself in any manner with the country's politics. They will respect the customs of the people and adapt themselves to their ways while there.

A geologist is expected to be cooperative and ambitious. This means that there is a considerable amount of committee work in modern business involving a variety of expert talent. Sometimes a lot of good sound information comes from one who may never have gone to college. To have ambition means progress, the will to do things, courage to take risks, and confidence in one's own ability. The accomplishments of real geological progress are not even in sight, and will probably not be in our time.

The ability to express one's self is a trait of greatest importance. Write in the simplest, clearest terms possible. Industry does not pay one to turn out poorly written reports for others to puzzle over.

What mental equipment are we expected to bring from college? A substantial edifice erected in the science of geology requires that we build for ourselves a sound foundation in fundamentals. A few geologists learn these truths the hard way after they leave college, but unfortunately this entails a tremendous amount of spinning of wheels. The college is the place to set the cornerstones, so that when we get to the application of our science, we need not be so often embarrassed by the toppling of the edifice we are trying to erect. A man well equipped with this fundamental knowledge will be of such more value to his employer than one with a smattering of such training and a lot of so-called methodology that does not require a college education to learn, and may be quite out of date.

Since our industries have depended more and more heavily on mineral resources, the geological profession has grown proportionately. It may be said that many geological scientists have shown a talent for business or other types of administration. These men have risen high in the business world, although they started out as technical workers. Even though these are exceptions, the man who is soon to become aligned with the application of geological techniques to industrial problems has a wonderful opportunity to make a place for himself in the geological profession.