

GEOLOGY AS A CAREER

Geology used to be introduced as “the study of the earth”, however, in the 21st Century, it is far more than that. Geologists are now called upon, for instance, to advise and interpret the spectacular discoveries on the moon, the features in the amazing photographs of the planets in outer space that are being explored, and to analyze the samples collected by remote robots like the Mars Lander.

Geologists today are also called upon to be involved in understanding the issue of global warming. They are particularly suited for this task because it is their mission through the study of rocks, glacial deposits, and river and lake deposits, to reconstruct the past environments that have affected planet Earth. Knowing what happened in the past is critical to understanding what will happen in the future, and this information can be used by local and regional governments to plan for orderly development, wise use of our resources, and protection and preservation of our environment.

There is hardly a day that goes by without headlines in the newspaper and on television about some natural disaster such as earthquakes, tsunamis, landslides, floods and volcanic eruptions. These hazards are all of interest to geologists, and in fact, it is their expertise that contributes to the knowledge and understanding of these natural events. Time and time again you see geologists being interviewed on television explaining the reasons for one disaster or another.

Another vast and challenging field that has developed for geologists is the service they provide for engineering projects such as the location and construction of transportation routes like the Coquihalla Highway, the Trans Canada pipeline system, and the Mackenzie Valley corridor in Northern Canada. Even forest access roads require the advice of geologists to determine the least expensive and the safest route so that, for example, the roads avoid natural hazards like landslides, and sensitive localities that may create erosion that could pollute fish-bearing streams.

The oil and gas industry in Canada is likely the largest single employer of geologists. Their mission is to keep discovering hidden deposits of oil and gas deep below the surface in order to maintain our current high

standard of living and our demand for energy resources. The basic framework for this overall task was the mapping of rocks and structure in the Rocky Mountains and other outcroppings of rock in whatever area that may have potential. Much of this has already been done in Canada, so now petroleum geologists are mainly involved in subsurface studies. This involves continued analysis of the results of past drilling ventures by looking at core and drill-cutting samples, usually through a microscope. Also, today there are many sophisticated instruments that are lowered down drill holes to record various electrical, physical, and radio-active characteristics of the rocks encountered that help trace the distribution of these deposits. By compiling all of this data geologists are able to re-construct the subsurface distribution of oil and gas bearing formations so that they can pinpoint the location of a successful production well. Geologists work hand in hand with a number of other experts in this activity. Chief among these is a geophysicist. Geophysical surveys rely on bouncing energy waves from a surface source (such as dynamite explosions) into the subsurface and recording when these waves return from various reflecting layers below. These days there are highly refined computer methods available to analyze all this information raising the level of successful discoveries. Geologists also rely heavily on paleontologists, experts in the field of ancient life or fossils. By identifying fossils in rock from drilled wells, paleontologists are not only able to determine the age of the rocks, they can almost precisely identify the kind of environment in which the deposit formed. For example, they may find fossils that are known to have lived at the edge of a coral reef, one of the best oil and gas reservoirs. Or else they may find that the deposit is an ancient riverbed and that information is used to trace the river in the subsurface leading to the discovery of oil and/or gas in porous sandstone deposits.

The second largest employer of geologists is the mineral industry. Gold, silver, copper, lead, zinc, uranium, aluminum, nickel, iron, to name a few, are highly critical resources for just about every manufactured thing in the world. The search for these deposits is a never-ending activity for geologists, and techniques employed are similar to those in the oil and gas industry. Most mineral bearing regions in Canada have now been mapped in a general way, and the occurrence of minerals has been recorded. Many economic deposits have been discovered and there are numerous mines all across the country. By studying the nature of the existing mines, geologists can use that information in their search for new discoveries. When a prospective area has been found, claims are staked around the area of

interest. This is when the geologists map the claims in detail, sampling and assaying the surface rocks and soil, compiling the results, conducting geophysical surveys, and finally determining where they should drill for the best chance of success. The drills used in the mining industry are called diamond drills, so-called because the bits at the end of the drill are embedded with tiny diamonds, the hardest material on Earth, that are able to cut through the bedrock and recover solid rock in a core that is recovered. This core is then assayed for whatever mineral they are looking for. After extensive drilling, the information is then evaluated to determine if the value of the ore deposit outlined will provide a handsome profit after all of the expenses of removing it are taken into account.

The third largest employers of geologists are likely government departments. Every Province in Canada and most Territories have geological departments. They conduct mapping projects, do research on existing deposits, act as advisors to exploration companies, and administer the regulations of government concerning exploration and production of mines. Government geologists also have an active role in advising politicians at both provincial and federal levels about the quantity and quality of Canada's resources, and how they should be developed in an economic and environmentally sensitive manner. They also get involved in evaluation of various industry proposals for one development or another. For example, a proposed pipeline to the Mackenzie River delta area where there are huge social concerns and impacts on the native people and where the environment consisting of permanently frozen ground offers special engineering challenges. A recent project that required years of environmental and regulatory study was the opening up of one of the richest diamond mines in the world near Lac de Gras in the Northwest Territories.

Another significant employers of geologists are universities and colleges. Here geologists find themselves in a somewhat pristine environment. Firstly, they have the lofty privilege of teaching geological fundamentals to a great variety of youthful students, like you. These are not just students that are majoring in geology. It could be students from any discipline that require an elective and choose geology. The academic atmosphere is one in which a great amount of research is done, and great strides in the advancement of geological sciences are accomplished. Funding for research is particularly easy to obtain in universities on application for research grants to the National Research Council in Ottawa. The Federal Government provides millions of dollars each year to university professors.

They have a significant labour pool to assist them when students go on to post-graduate work and need employment prior to graduation and entering industry. Numerous PhD's and Master's students subsist due to these research funds.

A rapidly growing employer of geologists is the consulting industry. This includes environmental, engineering and geological consulting companies all across Canada. There are about 20 of them right here in the Okanagan, and probably a hundred or so in Vancouver. Geologists in this industry in my opinion have the greatest variety of work experiences and the most interesting and challenging projects to work on. Of course, I am somewhat biased since I have been a consultant for the last 40 years or so and have travelled all across Canada and to many international destinations, and been paid to do it.

A geologist is like being a detective with a mystery to solve. You have to get answers to problems. This is done by observing, measuring, analyzing, considering various scenarios, using imagination, being creative, until finally the answer, or the truth, is revealed. This is the ultimate professional and personal satisfaction.

Last but far from least is the financial compensation that awaits successful geologists. The starting wages paid to graduate geologists ranges from \$30,000 to \$40,000 per year for a Bachelor's degree. Add at least \$10,000 for each degree above the Bachelor category. A PhD assistant professor at a university, for example, could expect \$50,000 to \$60,000 to start, and maybe more if you are really good. The same scale would apply to government jobs. But in industry, the starting wages are usually higher.

Geologists have an edge over the ordinary person when it comes to making money. The reason is that much of their life involves the resources of the land. Many have even formed their own companies that have made spectacular mineral or oil discoveries that have made these individuals multimillionaires, and in some cases, billionaires. Name one profession that has that much to offer! Because of their training and interest, even ordinary geologists, that are not necessarily that fortunate in producing their own "gold mine", are keen investors that can use their expertise and can make money, buying and selling shares in resource companies that are exploring, and that are listed on the stock exchanges, not only in Canada but in every developed nation in the world. This is big business. It is not unusual to make

an extra \$30,000 to over \$50,000 a year for a geologist with a bit of experience and some luck.

Also, as you gain more and more experience, your knowledge and capability and wisdom as a geologist becomes more and more valuable, and if you work for an organization, your salary increases in direct proportion to this increase to your value to the organization.

As a conclusion to this presentation, I have to tell you that a geologist can look forward to a wonderfully diversified and fulfilling life. He or she will have the opportunity, likely, of travelling to many places in the world, experiencing many different cultures, meeting a vast array of interesting people, and if you ever want to become an author, or an artist, as I have, you will have plenty of material to go to work on in your senior years, and a comfortable retirement income. I wish all of you the best!

But, hold your applause, because I have an announcement to make. When you graduate, if you think you would like to pursue a career in geology, the Kelowna Geology Committee has a Bursary fund endowed at the University of British Columbia Okanagan right here in Kelowna that pays a successful applicant up to \$2000. And you don't have to necessarily be an Honour student. So check this out when you are ready. Two books on the Kelowna and Okanagan Geology have been written in the last ten years by local geology and engineering volunteers, a spectacular example of what professionals are willing to give back to their communities. The latest edition is called "Okanagan Geology, British Columbia".

Murray A. Roed, PhD.