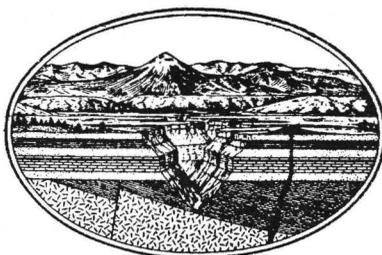


United States Geological Survey

A Career in Geology



WASHINGTON, D. C.

MARCH, 1948

U. S. Geological Survey

A Career in Geology

(March 1948)

If your ambition in life is to get the most dollars per foot-pound of effort, it will be a waste of your time to read further. But if you have a consuming interest in geology and are willing to take some of your compensation in other values than money, you may want to read on. What the United States Geological Survey has to offer is an unequalled opportunity for doing geology, both in the field and in the office. Geology as a descriptive science still has enormous tasks before it. Geology as a quantitative science is almost a virgin field. Both present real challenge to geologists with initiative. The Geological Survey is deeply concerned with both these aspects of geology and is working at both on a large scale; and it needs geologists of ability to carry on this work.

Take the geology of fuels for example. Tens of thousands of square miles of potential oil and gas country waits for you, or someone, to map its areal and structural geology in order to show industry where to wildcat. Comparable thousands of square miles of coal-bearing country, also, has still to be mapped and the beds measured. Not all the problems in the geology of coal have been solved by any means. Coal is an up-and-coming major source of energy for the United States, to say nothing of its future as a source of chemical raw materials. The geologist who becomes an expert on coal now will not be hunting for a job 10 years from now.

In the field of mineral deposits, metallic and non-metallic, a challenge confronts you like the one that confronted petroleum geologists 25 years ago. Prospectors and geologists have already discovered the easily discoverable deposits in the United States - those that cropped out or that had obvious surface indications. The chances are good, however, that other mineral deposits, not unlike those already exposed in numbers and richness, lie hidden below the surface. But finding them will take hard work and clear-headed, imaginative thinking. You will have to make the most of existing knowledge and push ahead to new frontiers. You will have to map, and map; and you will have to use not only geology but many related sciences and techniques to their utmost limits. Nothing short of this will do the work. This job is thorny with unsolved problems - but so is all this geology at its best, and for those who have eyes to see the problems and energy to attack them, the thorns are spurs to achievement.

If you wish to gain a comprehensive picture of the diverse geology of this country, and if you like to travel, you may find the requisite challenge in a specialized kind of reconnaissance work that the Trace Elements Office has under way. You might find such work valuable for two or three years, but then you would be ripe to undertake detailed investigations within a limited area, where you could work in three dimensions. The Survey needs geologists now for the immediate reconnaissance work, and will continue to need the balance provided by geologists who have had extensive reconnaissance experience -- men who can not only discriminate between trees and forest but also who can tell one kind of forest from another.

If your education has been slanted toward engineering, or from engineering toward geology, you may do your best work in

the Section of Engineering Geology, which is mapping geology for the express purpose of helping construction engineers to plan such works as highways, dams, canals, bridge piers, tunnels. Most of what you would do for the Survey in that Section would be geologic mapping and basic investigations to be applied by engineering geologists who work directly on construction jobs.

Closely related to engineering geology is the Survey's program of ground-water hydrologic investigations. Ground-water is so much prized now by industrial, agricultural, and domestic users that most of the known underground reservoirs are over-taxed. If you are intrigued by the combined geologic and engineering problems of recharge and rate of yield, and by the physics of flow in all kinds of aquifers, you can have that as a career, provided you can maintain the pace. Imagine, for example, diverting fresh water into a strip of coastal sand dunes, so as to build up a ground-water barrier against the intrusion of sea water, while recharging, at the same time, the underground reservoir with fresh water on the landward side of the dune strip.

Military geology combines engineering geology, ground-water hydrology, and soil science, but applies the results to military uses. You can gain experience in this line by geologic mapping and investigations in the Pacific Islands, or by mapping in certain camps and training areas in the United States. Please note that the armed services keep their hands strictly off these operations; they merely finance them. If for some reason you cannot do field work, there is plenty of office interpretation and synthesis waiting to be done in Washington.

You may not want to direct your efforts toward the immediately economic phases of geology. Well, not all of the Survey's efforts are directed that way. Some of you can get field

experience, and make careers for yourselves, in systematic areal geologic mapping in areas where the prime purpose is to study structure, stratigraphy, igneous geology and metamorphism, glacial geology, or geomorphic history. Or the problem may be pure research on one or another geologic process. Given the right background and interest, you might gain experience, or even make a career, by studying volcanology or the permafrost of Alaska. Much more geologic mapping is wanted than the Survey can now undertake. For example, the Division of Soil Survey, Department of Agriculture, wants us to make thorough geologic studies of some 10,000 square miles of complete geologic investigations a year to serve as a basis for their work. If you are interested in soils there is a wide-open field for research to determine the source and distribution of trace elements in soils, and to determine what geology can gain from soil science and vice versa.

If paleontology claims your interest, you will have seen that there is room for plenty of it in the programs already indicated. What those jobs call for is stratigraphic paleontology, and in order to make your stratigraphic determinations meaningful and helpful, you would have to acquire a considerable body of experience in geologic mapping. Incidentally, if you so desire and are qualified, you can pursue studies on the biologic problems of paleontology. Museum and laboratory studies are, of course, an essential part of all paleontological work.

Geochemistry or geophysics may have aroused your interest to such a degree that you question whether you are a geologist, a chemist, or a physicist. If so, you stand to gain in the long run whichever line you follow, for it appears highly probable that many of the tough and unsolved problems in geology await the intensive application of chemistry and physics. Geologic processes are special problems of chemistry and physics - or

specifically of geochemistry and geophysics. If you desire either experience or a career in geochemistry or geophysics, the Survey is definitely interested in you.

In undertaking any of the jobs within the Survey's activities outlined here you are encouraged to seek out and develop (mostly, candor compels us to say, on your own time to begin with) scientific by-products of your assignment, and not only to develop these by-products but to publish them in scientific journals. You are encouraged to publish. But bear in mind that your articles will bring you all the more credit if you learn to write in clear, straightforward English.

The Survey's Long-range Programs

These diverse activities are the Survey's response to a national problem that yearly grows more acute. Unlike some other natural resources, mineral resources are not renewable. Mine out a lode or a coal bed and you have a hole in the ground. Exhaust an oil field and you have an under-ground reservoir of brine - or a surface area depressed by settling. The data at hand indicate that for many mineral raw materials our rate of use now exceeds the rate of discovery. The Survey's programs relating to fuels and minerals are designed to attack this problem along a broad front and over a period of thirty years.

Engineers (both civil and military), agriculturalists, and economists show a growing awareness of the basic role geology should play, particularly in planning for construction and for land use. Indeed, the same awareness is growing in the minds of many geologists, who as a class have long been too little mindful of the wealth of down-to-earth values that can be extracted from a good geologic map. The Survey's programs in

engineering geology, military geology, and areal geology are shaped to meet these growing needs.

With the help of universities, colleges, State geological surveys, and the mineral industries, we hope to map the geology (on an inch-to-the-mile or larger scales) in the remaining 12,500 unmapped 15-minute quadrangles in the United States within the next 30 years. That will require many thousands of man-years of geologists' effort. But impressive as that may be, such a task will require roughly two and a half times as much effort to perform the supporting research in geology, paleontology, geochemistry, geophysics, ground-water hydrology, geologic cartography, etc. required to keep the whole program balanced.

A comparable long-range plan for Alaska is to be started this year. This calls for reconnaissance geologic mapping (on four and two miles to the inch) of thousands of square miles ranging from southeastern Alaska to the Arctic slope and from the Canadian boundary to the tip of the Aleutian islands. Besides that, geologic mapping on an inch-to-the-mile scale of thousands of square miles is planned as a basis for more detailed investigations of mineral resources, or for other specific objectives such as permafrost, volcano studies, or engineering geology.

Employment -- Procedure and Compensation

You will probably want to know what you would live on if you went to work for the Geological Survey. That would depend, at the start, upon what training and experience you have already had. For those who have had less than 30 semester-hours of geology there are available a moderate number of the following Field Assistant jobs:

In United States

	Annual Salary
Geologic field assistants	\$1,954.00
(salary depends upon the training	2,168.28
of the individual and the require- ments of the job)	2,394.00

In Alaska

Add 25 percent to each salary for the time actually spent outside the continental limits of the United States.

These are temporary jobs, held only for a field season or for the duration of a particular assignment. In the United States you must pay your own travel expenses to the place where you report for duty, but while on duty away from that place you will receive actual expense money not to exceed \$4.50 a day. For such jobs in Alaska the Survey pays your travel expense from place of actual residence at time of appointment to Alaska and return. While in Alaska, you will be allowed per diem expenses not to exceed \$7.00.

If you have successfully completed a full 4-year course in a college or university leading to a bachelor's degree and have had at least 30 semester hours in five or more basic courses in geology, you have the minimum Civil Service requirements for the lowest grade (P-1) of the professional series. To qualify for the next higher grade (P-2) you must have had, in addition, two years of professional experience in geology. Note, however, that graduate work in geology that includes 30 or more semester hours a year of geologic study can be

substituted, year for year, for the professional experience. More detailed information about qualifying requirements may be obtained from the announcement for the examination which the Civil Service Commission has already sent out.

The entering annual salary for each grade is listed below:

P-1	\$2,644.80	P-5	\$5,905.20
P-2	3,397.20	P-6	7,102.20
P-3	4,149.60	P-7	8,179.50
P-4	4,902.00	P-8	9,975.00

Expenses of official travel are paid for, except that a new appointee must pay his own way to the place where he first reports for work. While on duty away from your official headquarters, which might be Washington, Denver, or one of the regional offices, you would be allowed expenses not to exceed \$6.00 a day in the United States, \$7.00 a day in Alaska or most foreign areas, and \$2.00 a day while on shipboard.

For work in Alaska add 25 percent to each salary for the time actually spent outside the continental limits of the United States. For work in foreign areas the salary is generally one grade higher but you must meet the minimum training and experience qualifications of that higher grade.

Appointments are made in grades P-1 and P-2 from registers of those who have passed the assembled competitive examinations, one of which is to be given this spring. If you pass the examination and take a P-1 appointment immediately upon completing

your undergraduate work -- that is, if you offer only the minimum qualifications -- two years of professional experience on the job will be required before you can be advanced to P-2. But graduate study can be substituted for that professional experience, and we recommend that choice; field experience can thus be obtained during the summers while continuing graduate work during the school year. Your appointment can be held intact either by granting educational furlough or by placing you in a part-time status, wherein you would be expected to work for the Survey during a small part of the time while attending your university or college.

Appointments to positions in grade P-3 and higher are made on the basis of ratings determined from the applicant's training and professional experience. Such ratings can be obtained by submitting, on Form 57, statements of your training and experience to the Civil Service Commission. This is an "open" or continuing examination and applications will be received and rated until a sufficient number of eligibles is obtained.

Promotion

The average pattern for advancement is shown by the accompanying graph. You will be mistaken, however, if you conclude from this curve that length of service is the only, or dominant, requisite for advancement. The guiding philosophy of the Survey is that salary shall be commensurate with worth to the organization. Attainment in scientific work is a rather direct function of personal attributes. The geologic work load of a research organization like the Survey is not definite and static. The size of the field being attacked at any moment, and the effectiveness of the attack, are determined primarily by the

resources available for research; and of these resources the personal qualities and professional stature of the scientists on the staff count for more than anything else. There is a great difference in worth to the Survey between a geologist who merely performs his prescribed duties day after day, no matter how faithfully, and a geologist whose job continuously grows in actual importance because the geologist himself is growing.

The first year of appointment from a Civil Service register is probational. During that year your personal attributes and potential capacities will be appraised as critically as possible. That appraisal is in fact a part of your examination.

Your advancement or success as an individual on the Survey are not determined by whether you do or do not have advanced degrees. But we do encourage you to get all the graduate work you can, because it is better for you in the long run, and because whatever makes you a better geologist makes us a better Geological Survey. Educational furlough will be readily granted, and if it can be managed within the limits of our program we will do our best to see that you get an assignment out of which you can get a doctorate thesis. Our record on this score is reasonably good, though the timing is not always just what either the geologist or his school might choose. The Survey is not a wholly free agent in such matters, so that there is need for adjustment in plans and schedules.

Retirement and Insurance

Retirement provisions have just been revised and liberalized by Congress. Retirement at 70 is compulsory except in the increasingly rare instances when an extension for one or

two years is granted. There are various permissive arrangements for earlier retirement, depending on length of service and on other factors too complex to be explained here. Six percent of your salary is deducted as retirement compensation. This draws interest at 3 percent, compounded annually. You may deposit, if you wish, additional sums up to 10 percent of your annual salary to purchase additional annuity. The amount of annuity an employee can get depends on many things but perhaps it will suffice to say that the proposed new retirement provisions will work in part, at least, according to this formula: 1.5 percent of the average annual salary for the 5 consecutive years when the salary was highest, times the total number of years of service. Hence if the geologist's salary had averaged \$8,000 for 5 years and he had had 45 years of service, his annuity would be \$5,400. The optional retirement provisions, also, are liberalized. If you die while in service certain annuities are payable to your widow and children or your equity in the retirement fund is payable to your designated beneficiary.

Group life insurance is available for members of the Interior Department in units of \$1,000, up to, but not exceeding, \$3,000 for people up to and including age 35. Beyond 35, the amounts of insurance decrease progressively with increasing age but the cost remains fixed. This insurance may be continued if you leave the Government service. No policy is issued to a person over 60 years old.

Home Base

Geologists are paradoxical creatures. A primal urge drives them to seek, and to enjoy, remote places and frontier ways of

life. A still more primal urge impels them to marry and seek a home where they and their families can put down roots. How you resolve that paradox is your problem.

The Geological Survey is encouraging its geologists to establish homes at Denver, where a sizeable Federal Center is growing. A little later, when we get considerably more space in or near Washington, we shall encourage those who wish to do so to establish homes there. In addition to these home bases smaller numbers of geologists have established domiciles at the Regional Offices (Spokane, Salt Lake City, Madison, and Knoxville) and at several of the large, long-term project or program bases, such as San Francisco; Grand Junction, Colo.; and New Philadelphia, Ohio.

Women

We used the masculine pronoun because most geologists are men, because most of our jobs are for men, and because it keeps us out of the "his or her" style. But you women need not feel slighted; we are interested in you and have jobs for you. We already have women geologists ranging from P-1 to P-5, doing jobs that range from office assistant to field geologist. Several are on duty, or have been, in the western Pacific and others in the field in the United States, and one is an airborne geophysicist who gets around - from Alaska to Mexico and from East to West.

Other Compensations

What makes work in the Survey worth while is a question so subjective that perhaps no one ought to try to answer it in

writing; nevertheless we venture to try. Certainly it is not merely the pay; and a Survey man recently said, on turning down his fourth offer of a job outside, "It's not the retirement provisions that make me do it." Part of your intangible compensation will be in the form of experience -- a word that has several meanings. Experience in the sense of training has sometimes been used by Survey geologists to get remunerative work at universities or in private industry, and it will doubtless be so used occasionally in the future. We hope, however, that most of you will plow in your training, as it were, to make yourselves more and more useful in a long Survey career. Experience can also mean adventure, which will come, incidentally to some but not to all. Those to whom it comes are welcome to enjoy it provided they enjoy geology still more. Perhaps the best of your experiences will be association with a large and varied group of other scientists who share similar interests.

Most important of all, however, is the opportunity to tackle challenging problems in geology and to be provided with the facilities and time to do a well-rounded job, plus encouragement to publish the results. Furthermore, while preparing your manuscripts and maps for publication you are exposed to the frank and penetrating criticism of your more experienced colleagues -- an ordeal that, though you may flinch from it at first, you will come to welcome and prize highly for its beneficial effect on you, your published papers, and your reputation.

