EDUCATING GEOLOGISTS FOR???

No, there is no error in the title. I have not forgotten to replace the question marks by samething more definite because it describes exactly what I wish to discuss: What are we educating our geology students for? The answer seems obvious: 'To be geologists,' and has so been accepted for many years. Current reality, however, has changed that complacent scenario in many ways.

First, there is the changing labour market. Ten to fifteen years ago the petroleum and mineral industries hired more graduates in geology than all other employers combined. Today, in Europe as well as in North America, this is no longer so. Whereas a decade or so ago those of us engaged in the teaching of geologists expected that all but the totally hopeless would enter the mining and oil industries, join geological surveys and research institutions or embark on educational careers, the bottom has dropped out of this market including, to a large extent, even the academic one. A recent article in Geology Today, the monthly newsletter of the Geological Society of America (March 1995) brings this out in sharp relief.

Not only has the job market shrunk, the hopefully employed have increased in numbers. A major factorare the broad curricula and greater freedom of personal choice now offered by many institutions of higher education, which permit students to sample more widely what is available. These and the growing flexibility of
degree programs allowing mixed courses of study and second or third year changes of the major subject are capturing large crops of students who do not envisage the traditional careers in geology, geophysics or geochemistry. Thus, while the employment situation grew tight, student numbers held constant or even, in many places, grew. Many departments today find themselves catering to a clientele that regards a set of courses in the earth sciences as part of their general education. And the more of such the better, I should say; the earth is worthy of the attention of a broader audience than from professionals alone.

The employment scene is not all gloom, I should add; a flourishing group of environmentally oriented companies and consultants still offers bright opportunities, but so do newly born departments of environmental studies and older departments of geography which, with their broader : (although sometimes shallower) programs often out-compete the oldline providers of the knowledge of the earth.

Therefore, as a small but significant 3 sample of geology departments in British universities confirms, during the last several years employment of graduates in their own field has dropped in many cases to less than one third and in some much even more. Still, few go jobless because employment in other areas of business and industry now absorbs anywhere from twenty to forty percent, while a 3 much higher fraction than before now: postpones its entry in the job market by continued education in the earth sciences. Although the market for university faculty and researchers is flat, possessors of good higher degrees, especially the MSc, still find

signs of life in the consulting and industrial job market. Here too, however, they encounter sharp competition from their more broadly educated peers in the environmental sclences.

To return to the newly graduated, why do they seem to be so attractive in fields ranging from brewers to bookmakers? It is a long-debated question and many answers have been suggested of which the simplest one says 'Business likes people who are well educated, can think for themselves and know how to read and write (as well as speak, I suppose)!' My old alma mater, Stanford University, once attempted to determine where its undergraduates went after obtaining their degrees. Somewhat disconcertingly it found that for a generous one third it did not seem to matter what they had been taught; the jobs they secured (and in most cases held on to) scattered all over the employment map, including my favoured case, a woman with a BA in Classics who runs (ran?) the San Francisco Underground.

Clearly, this broad employability also benefits geology students on this side of the Atlantic, but what lies behind this strange although happy phenomenon? Is it true that our budding geologists are so well educated, so thoughtful and articulate, so innovative that they can find their way through almost any business jungle? This would be highly gratifying to us, their teachers, but it is not easily seen how it was done. Where insight fails, a buzz word soon appears. In this case it is the term 'transferable skills' (which means marketable).

I have just spent a fair part of a year as a member of teams which, on behalf of the Higher Education Funding Council, descended like packs of locusts (and welcomed with the resigned fear of farmers in warmer parts of the world) on many geology departments, there to assess the quality of their teaching. For this godlike trade we were prepared by people who teach others how to teach and who introduced us to transferable skills.

Even at university level reading and writing, although regarded as basic, need further develapment not usually seen by us as the imparting of transferable skills, but they alone do not insure understanding either by the author/speaker or by the audience. The higher forms of reading and writing, to lend the teaching more dignity, are known as communication skills and the teaching of communication skills is highly valued by those who pay for the education of our children. Anyone who has tried to understand civil service prose can appreciate this. Communication skills appear to be a grab-bag of things ranging from using bullet points in visual aids to the ability to prepare and defend a poster presentation. High tech is there too, together with and perhaps ahead of many other methods, although it is often recognised that the ability to read and write plays same role in using a wordprocessor or calculator. Known as IT (very short for information technology), this is the holy grail of transferable skills. For centuries it consisted of an acquired skill in locating the reference shelf in the library and the encyclopedia on it together with a natural talent for outwitting its editors by finding the sought-for topics in the index.

Today it means the information highway, CD ROMs and the ability of filtering vast swamps of information and a knack for the efficient separation of great heaps of chaff from a few grains of real information. Some experts in IT even manage to synthesize their finds into something useful. Some of this we may discount, thinking that those who did not subconsciously pick up those skills along the way do not

belong in university. This is, of course, callous and politically incorrect, and the challenge to salvage the IT-challenged (usually by means of massed computers) is an honourable one. Alas, soon the health of any university system may depend to a worrisome degree on how well it meets this challenge.

While assessing teaching quality I have seen departments that ride the fashionable wave by teaching transferable skills as clearly identified (although not always deeply integrated) components of the curriculum. When the question is asked, as it will be, how much value was added to the students as they made their way through the course and it turns out that, although few found jobs in the profession for which they had trained, most somehow survived, transferable skills can be credited.

The sciences are expensive to teach and scientists are expensive to employ and start earning their keep much later in life than many others. One may therefore ask whether the opportunity to earn a geology degree should be provided to quite so many in so many universities if what the majority of the graduates actually need are transferable skills. A much 3 smaller number of geology departments might suffice to provide the few trained earth scientists the world demands. Yet while that number continues to shrink, the number of degree-offering institutions may even be rising.

This view is grossly over-simplified. Other institutions have found ingenious ways of weaving the carefully designed teaching of transferable skills tightly and almost invisibly into the fabric of geology. Ours is a discipline that lends itself particularly well to such a approach, not only because we do write and read, need computer and communication skills and learn or try to learn how to apply the skills learned in other subjects, maths, physics and chemistry perhaps, to the problems that face a geologist. Thus we learn to value the power of back-of-the-envelope calculations as a first stage in attacking a problem. From our first day in the field, we learn how to get on with our peers and end by incorporating the meaning of team work into the pattern of our working life.

It may well be that the highly interdisciplinary nature of geology is especially suitable to instruct the highest forms of transferable skills, the skill of finding and evaluating evidence and the skills of problem solving, of decision making and of collaborating. These skills reside, I submit, at the summit of desirability, but cannot be taught by themselves and not without a subject of adequate complexity to practise them on. A great geologist, Claude Albritton, once suggested to me that the earth sciences are a subject of great subtlety and difficulty because, where physics and chemistry merely answer the questions of WHAT? and HOW? (and as questions go, those are the simplest ones), geology must also ask the historical question HOW COME?. At the top of the pecking order sits biology asking, often with some bewilderment, WHAT FOR?

Perhaps then we are fortunate in that, besides producing good earth scientists, we have the opportunity of producing first class problem solvers imbued with a deep respect for the evidence. The world needs a lot of those.

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