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Where is Geotechnical Practice Heading - An Engineering Geologist's Perspective

F.J. Baynes

B.Sc., M.Sc., D.I.C., Ph.D., C.Geol.

Consulting Engineering Geologist, Golder Associates, Australia

1. INTRODUCTION

These comments were prepared at the request of the organising committee and present my views as to where geotechnical practice might be heading. The comments are from the perspective of an engineering geologist practising in mining and civil geotechnical engineering, and focus on the contribution that geological thinking makes to geotechnical practice.

2. WHERE IS IT NOW ?

I suspect that engineering geology is failing to contribute to geotechnical practice in proportion to its importance, particularly in Australia. This is not to say that engineering geologists or engineers who think like geologists are not applying their skills, but that the branch of knowledge known as engineering geology seems to have stagnated and is not generating anything relevant, new or exciting.

A simple measure of the current intellectual impact of engineering geology might be the content of papers published in the last two ANZ Conference Proceedings, characterised as follows:

	5th ANZ (105 papers)	6th ANZ (103 papers)
Some geological input - a geological section or profile included with text	36%	18%
Rudimentary geological model- geological map and section included with text	14%	10%
An engineering geological study - deals with the engineering implications of geology	6%	9%

There could be all manner of explanations for this situation and indeed it may be a poor way of characterising the Proceedings, but I think that in part it reflects that those of us (engineers and geologists) who practice geology are failing miserably to "keep the geo in geomechanics".

In support of this view, I would suggest that research and teaching in engineering geology in Australia is far from outstanding, and that there is very little engineering geological activity within the

Geomechanics Society. Compare this situation with, say, the contributions of the working groups of the Engineering Group of the Geological Society of London, although I get the impression that even overseas, engineering geology has lost its impetus.

At a project level it seems that engineering geologists do not tend to contribute vital concepts from pure geology into practical geomechanics e.g. the influence of plate tectonics on insitu stress systems, the origins of defect sets as controls on their distribution and shear strength, geomorphological models of slope development as frameworks for slope stability assessments etc. All too often data is simply collected in a standardised and quite effective manner, but consideration of the meaning of the data lacks any interpretative flair.

3. WHY ?

In Australia, largely intentionally, the distinction between engineers and geologists in geotechnical practice has been lost. Whilst in many ways this is a laudable situation, if individuals do not consider themselves as geologists the opportunity to nurture divergent geological thinking tends to disappear within the more focused, convergent engineering thinking. In addition engineering geologists tend to adopt an engineering approach - for all the right professional reasons - and thus tend to abandon their quintessential geological nature, and engineers who are good geologists also tend to be very good engineers and their geological capabilities are, at best, secondary characteristics.

This situation is possibly reinforced by the Geomechanics Society being a branch of the Institution of Engineers with the connections between the Australian Geological Society and the Geomechanics Society being poorly developed, and the engineering group of the Australian Geological Society irrelevant to most practitioners (it has become the environmental group). This situation can only tend to reduce the potential for the transfer of geological thinking into geomechanics. This may well be very different in New Zealand, and certainly appears to be different in USA or UK where engineering geologists have their own learned Societies.

This situation has been exacerbated by the continuing changes to Mines Departments and State utilities, which are shedding their engineering geology service groups and hence dissipating skill centres. The trend is also reinforced in general practice where practitioners tend to be "project managers" and, whilst geological skills are valued, they are probably not valued as highly as some combination of general geotechnical engineering and marketing skills.

4. WHERE IS IT HEADING ?

All of the indicators suggest that there will be ever increasing opportunities for geotechnical practitioners and this a reassuring state of affairs. However for all the reasons outlined above I am concerned that the engineering geological contribution to future practice will not necessarily keep pace with the expanding market and that the practice in general will suffer.

It seems likely that the graduate engineering geologists of the future will tend to be hybrids trained in both geology and engineering, supposedly ideally suited to industry requirements. However it is unlikely that the training for such people will develop geological skills to the same extent that a pure geology first degree would. Thus we may end up reducing the opportunity for synergy that can result from the combination of geological thinking and engineering thinking.

5. AN EXAMPLE

I would contend that it is at this stage in the development of geotechnical practice that the input of geological thinking has to actually increase significantly, to meet an acute demand for better geological characterisation. A textbook written by an eminent rock engineer begins a chapter on input parameters for design with a quote:

"If you can measure what you are speaking about, and express it in numbers, you know something about it"

Perhaps characterising geological conditions needs to advance beyond simple quantification if it is to improve? Another eminent rock engineer recently pointed out that:

"I see almost no research effort being devoted to the generation of the basic input data which we need for

our faster and better models and our improved design techniques These tools are rapidly reaching the point of being severely data limited."

I would suggest that the real data limitation is in the field of geological characterisation, and that ever increasing attempts at numerical representation simply are not allowing geological reality to be perceived. If a different way of looking at things needs to be developed by those who think like geologists, then the moribund state of engineering geology may well be contributing to this data limitation

Overcoming this deficit in methods of geological characterisation is just one of the many challenges facing practitioners that will require greatly enhanced geological knowledge and communication skills as an integral part of geotechnical practice. To do this perhaps we have to open the doors of perception and abandon the French detective's advice that:

"We can only see what we observe, but we can only observe that which is already in our minds"

6. WHAT TO DO

Change might be achieved if engineering geologists published more papers, and networked to generate some impetus towards developing relevant, new and exciting ideas. This process could be facilitated by the development of project related research programmes with a focus on engineering geology by universities and research institutes. The Geomechanics Society could consider ways in which it might support such endeavours, including the improvement of connections with other Societies, overt support for specialist committees, involvement in research programmes etc. However for such changes to gain momentum a paradigm shift leading to various engineering geological approaches that are more effective, and hence more attractive to the geotechnical community and our clients, would probably be necessary. Such a paradigm shift would be most likely to develop if critical intellectual masses were to be assembled, supported in a research environments, and involved in long term projects where engineering geology is the focus. For this to happen the real value of nurturing geological thinking needs to be recognised by the geotechnical community.