Surely understanding the causes of this pulsation must be one of Earth Science's greatest challenges!

Perhaps in this conference hydrodynamic traps finally came of age. Spawned with rigorous diligence by King Hubbert in the early fifties, they have lingered in the background, invoked where unavoidable, but generally avoided. Phillippe Riché described unclosed structural noses in Algeria where 700 million barrels of oil are trapped in Cambrian-Ordovician reservoirs. Later, Darryl Myhr and Nick Meijer-Drees described the Milk River hydrodynamic gas trap.

The biggest bombshell of the Conference, however, was dropped by John Masters of Canadian Hunter in the last talk in the Western Canadian session. His electrifying address lasted over an hour, and he stunned the conference with his assessment of the Deep Basin hydrodynamic trap in Alberta and B.C. In a thick Mesozoic section containing stacked sandstones and conglomerates Masters claimed you could not drill a dry hole, only a non-commercial one. All reservoirs below 3,500 feet in this area were gas-saturated and many intervals could be completed to flow successfully at economic rates. There was no conventional structural or stratigraphic trap holding this gas in place, it had to be hydrodynamic. Ultimate reserves were gigantic, probably several times the present known gas reserves in all of Canada, and the field could well be the largest in North America. In fact, these resources were so great that they had to influence profoundly Canada's future energy policies. The impact of Master's revelations dominated the conference, pushed policies off the front pages, and even stilled lobby discussion of West Pembina.

In between these highlights smaller groups of delegates attended geomathematics, paleontology and geochemistry sessions while, in the adjacent Glenbow Theatre, Hal Cummings had assembled an enticing program of films. It was a conference where everyone had to miss a lot that they wanted to hear, and this reviewer has certainly omitted describing many excellent talks. In other words, it succeeded.

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The Status of Geological Engineering

F.F. Langford
Department of Geological Sciences
University of Saskatchewan
Saskatoon, Sask. S7N 0W0

During May 15 and 16, representatives of the nine university departments teaching geological engineering met as part of the Canadian Conference on Engineering Education at Loyola University in Montreal. For the past several years, courses in geological engineering have had problems in meeting the requirements of the Canadian Accreditation Board of the Canadian Council of Professional Engineers. If a course in engineering is accredited, its graduates may register as Professional Engineers without further examination, and their registration generally may be transferred across Canada and to the USA. A particular stimulus for this meeting came from investigate accreditation problems in engineering physics and geological engineering. The committee, consisting of A.D. Moore, Electrical Engineering, University of British Columbia (Chairman); J. Ham, Electrical Engineering, University of Toronto; R.A. Blais, Geological Engineering, Ecole Polytechnique, and J.D. Smith, Mechanical Engineering, SNC/GECO, was to make recommendations to the Canadian Accreditation Board in June, 1978.

In simple terms, the problem is that the Canadian Accreditation Board in its Annual Report of 1977 considers geology to be a pure science, and provides in its standards for curricula that at least 12 ½ per cent of the curricula must be basic science. Although the time allocated for science is described as a minimum, when the other minimum requirements are taken into account, there remains only another 12 ½ per cent of the curricula unallocated, and this the Board suggests, "should be used to expand the foundations beyond the minimal limits and to build special courses for the various branches of engineering on these foundations". Obviously one cannot train a competent geological engineer under these constraints. At present, departments teaching geological engineering are making some concessions; some geology classes are being considered engineering science, and as a temporary measure the Board is accepting less than full compliance.

The portion of the meeting devoted to geological engineering problems was divided into four sessions. The first, chaired by Marc Tanguay, was devoted to brief presentations and discussion of the role of the geological engineer. Bryan Pryce (Imperial Oil Ltd.) and Kent Murphy (Rousseau Sauvé and Warren Consulting) described the role of the geological engineer in the Petroleum and Civil Engineering fields and stressed the need for geological engineers to be broadly and well trained in geology. Ron Patterson of Queen's University described his experience with the Ontario Government in reviewing geohydrologic proposals, and stressed the importance of competence in stratigraphy for engineers preparing these. Jim Neilson, also of Queen's University, filling in at the last minute, discussed the mining scene.

Roger Blais, in the second session chaired by Bill Brisbin, gave a brief résumé of his assessment of the answers to a questionnaire sent by the Moore Committee to all departments teaching geological engineering. He emphasized the problem of the definition of the geological engineer and geological engineering. The responses he obtained concerning the role of geological engineering were the traditional roles in mining, petroleum and heavy construction industries. Blais felt that modern roles were overlooked and fields such as geological hazards, oceanic and coastal engineering, groundwater, land use, environmental protection, and evaluation of natural resources should have been emphasized more. The response to the difference between geological engineers and geological scientists brought forward a central problem. When geological engineers are doing work similar to that done by other engineers they are engaged in engineering. When they are doing geology, as in exploration, then they are not easily separated from the geological scientists. Blais points out that the distinction also fades when a geological scientist does engineering work, such as mining engineering in a mine, or when a geological engineer engages in scientific geological research. All departments felt that accreditation was desirable, and since the last accreditation most had increased the engineering emphasis of their courses and the design component. However all were having trouble fitting in enough geology.

In the third session, representatives of a few departments discussed their courses briefly, and chairman Steve Scott prepared a list of geological components of the geological engineering curricula. This list (Table I) showed quite clearly which classes are basic to all geological engineering curricula, and which either served special options or were offered because of departmental specialization. A point emphasized by Pete Roeder was that in Canada, the so-called pure geology is taught in a much more practical sense than generally realized. All geology students are expected to be practical geologists, and much of their geological training is oriented towards engineering work. Thus many geology classes should be considered engineering science even when taken by "science" students.

In the final session, chairman Fred Langford attempted to summarize the positions in which departments found themselves and ways of coping with their problems. He constructed in Table II a simple model of a four-year curriculum in accordance with the Canadian Accreditation Board standards.

Table I *Geology Classes in Geological Engineering Curricula*

Subjects Included in more than ⅔ of Curricula	**Subjects Included in ⅓-⅔ of Curricula**	**Subjects Included in less than ⅓ of Curricula**
Physical Geology (s)	Phase Equilibrium (s)	Palaeontology (s)
Historical Geology (s)	Exploration Geochemistry	Advanced Mineralogy (s)
Mineralogy (s)	Mining Geology	Petroleum and Energy
Petrology (s)	Mineral Economics	PreCambrian Geology (s)
Stratigraphy and Sedimentation (s)	Geomorphology-Glacial Geology (s)	Exploration Management
Structural Geology (s)	Rock Mechanics	
Mineral Deposits (s)	Soil Mechanics	General Geochemistry (s)
Exploration Geophysics	Geohydrology	
Field Camp or Trips (s)	Geophysics of the Earth (s)	
Thesis		

The nine universities had 17 curricula in geological engineering. The (s) indicates subjects which would normally be included in geology curricula for majors in science colleges.

No differentiation is made between 13- and 26-week classes.

Table II

Type of Subjects	Number of Classes
Mathematics	3
Humanities and Social Sciences	3
Science	3
Engineering Science	3
Design and Synthesis	3
Engineering Science or Design and Synthesis	6
Unallotted classes to be used to expand upon foundation classes	3
	24

A class equals five contact hours per week for 25 to 30 weeks. The total of 24 classes represents a four-year course.

Although there are many classes in geology or geology-related subjects taken only by engineers, which could thus be considered as engineering science, as Table I shows, the core classes are taken by both engineering and science students, and therefore, in the minds of many engineers, are science classes. This necessitates using the three unallotted classes in Table II for core classes in geology. Blais earlier suggested that geological engineers had a vital role to play in solving environmental problems. Yet the portion of the curriculum available for pursuing advanced natural science classes needed to deal with these problems now is pre-empted by geology. Thus the only specialization available is more engineering classes, which makes the geological engineer better equipped to do the job of a Civil or other conventional type of engineer rather than that which should be his speciality.

This emphasized a point that Don Moore, Chairman of the Moore Committee, who attended all sessions, made earlier: that the common ground between geological engineers and geological scientists added considerably to the problem of defining geological engineering in the minds of other engineers.

This raised some discussion concerning a peculiar attitude that arises frequently which was exemplified in two examples. First Blais had reported there was some concern that field camps could not be considered classes in design and synthesis because they were taken by science students as well as engineers. Second, examples were periodically raised that engineering was defined only by the intention of the performer. For example, if a geologist prepared a geological map as part of an exploration project, then this would be geological engineering if the geologist had a degree in geological engineering, but if he prepared the same map using the same methods and the same information, as part of a regional survey, then it was not geological engineering.

Pierre Grenier, a member of the Canadian Accreditation Board who attended the final session, wanted to know what it was that geological engineers design, which raised the question, "Are geological engineers really engineers?" As it turned out, this may be the question the answer to which is really important if geological engineering is to be an accredited engineering course. At the same time, the Canadian Accreditation Board specified design as the hallmark of the engineer, and defined it as "an individual's ability to use the basic sciences, mathematics, engineering sciences, economics and social sciences to convert, use and/or manage resources optimally through effective analysis, decision making and/or synthesis to meet objectives. Such ingredients define the process of design, the hallmark that characterizes the engineering curriculum". The expression "manage resources optimally" when applied to natural resources characterizes the purpose of the geological engineer, and this may provide an affirmative answer to the question.

At the closing plenary session of the Canadian Conference on Engineering Education, Fred Langford presented a brief summary of the geological engineering section. He pointed out that the problems faced in the accreditation of geological engineering were not unique. As the findings of science became incorporated into our life style, so other branches of engineering have an accepted mechanism for incorporating today's science and making it tomorrow's engineering. Otherwise the role of the engineer would be restricted to traditional old-fashioned engineering and play a much smaller part in society than it now does.

With an attendance of 24, the geological engineers were well represented at this conference. One of the problems of accreditation is the lack of understanding of geological engineering by other engineers. Therefore it is important that geological engineers be represented at more general engineering conferences in the future.

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Conference on the Coastline of Canada – Littoral Processes and Shore Morphology

S.B. McCann
Environmental Marine Geology
Atlantic Geoscience Centre
Geological Survey of Canada
Bedford Institute of Oceanography
Dartmouth, Nova Scotia B2T 4A2

The conference (May 1-3, 1978, Halifax, Nova Scotia) sponsored by the Geological Survey of Canada, was the first national meeting to focus attention on the landforms, sediments and processes of the coastal zone in Canada. It was attended by 120 participants who heard 37 speakers present the results of their recent and current research on a variety of topics from widely separated parts of the Canadian coastline. Some of the papers were very specific, either by topic or geographic location, others provided a regional view of coastal characteristics. As might be expected, the contributions covered a wide range of environmental conditions and shoreline types, and during the three days the participants were instructed by some excellent presentations on various aspects of shoreline development around the four coasts of Canada – Atlantic, Arctic, Pacific and Great Lakes.

John Wheeler, Deputy Director-General of the Survey, provided a nicely pointed introduction to the meeting, noting its timeliness in view of the increasing interest in and demand for information about the coast, and recognizing the magnitude of the task facing coastal scientists. Long stretches of coastline have not been described, even in a reconnaissance fashion, and detailed studies have been carried out in only a few locations. A map of Canada showing the study areas described in the conference papers is indicative of present activity in the field, and to some degree also of the extent of previous research. The largest concentration of papers, five, in one small area, dealt with sedimentary processes in the macro-tidal environment of the Minas Basin arm of the Bay of Fundy, where there has been a relatively intense phase of research in the last five or six years. Including these papers, there were 16 contributions, nearly half the total, dealing with different aspects of the Atlantic coast south of Labrador. Topics included shore platform development in the Gaspe, tidal inlets in the Barrier Islands of the southern Gulf of St. Lawrence and the effects of Holocene changes in sea level around Nova Scotia. This contrasts with only two papers dealing with the Pacific coast, one of the Fraser delta, the other an overview statement which stressed the lack of coastal studies in British Columbia. The three papers on Arctic coastal features and processes reported on work which has been carried out during the past few years of Melville Island, Somerset Island and in the Mackenzie delta, but the six papers dealing with sections of the coast of Labrador, Baffin Island, and Hudson and James Bays were, with one exception, based on reconnaissance observations obtained very largely in 1977. The excitement of observing long stretches of almost unknown coastline for the first time was very well conveyed by the speakers dealing with Hudson and James Bays. The session of six papers on the Great Lakes covered bluff erosion, spit development and bar topography in the lower lakes and the evolution of rock shorelines along the Superior north shore. Though not so closely integrated as the Minas Basin group of papers, referred to previously, these contributions served very well to focus attention on a particular coastal environment in