SPECIAL ISSUE

Environmental Geoscience Research in the Atlantic Region

Foreword

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(Guest Editors)

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It has been 10 years since Atlantic Geology first published a whole issue dedicated to "environmental" geoscience, at that time concerning problems associated with the Lower Palaeozoic rocks of the Meguma Group (or Supergroup) (Zentilli and Fox, 1997). In the mid-1990s, the label "environmental" still had a strong political connotation and many geoscientists in industry, government, and academia were hesitant to associate themselves with the brand; only a couple of academics in geology departments in Canada indicated their specialty to be Environmental Geology. Not any longer. In the last decade there has been widespread recognition of the environmental issues threatening our planet, to the point where these issues affect voting patterns and the pocketbook of corporations. Environmental divisions are publicized in most resource industries and geoscience societies. Legislation now requires professional associations to monitor and regulate ethical practice in geoscience where it may affect the environment or human health. Students have demanded the creation of many courses and programs relating science and technology to environmental problems, as reflected in current academic calendars of Atlantic Canadian universities. New specialized journals have appeared that tap manuscripts on the subject and scientific meetings have many sessions devoted to environmental papers. Unfortunately, this success means that mainstream geoscientists and students may no longer be aware of, or get exposed to, applied geoscience that is being carried out in their midst, and yet there is need for more involvement and application of traditional geoscientific approaches to problems of groundwater, waste disposal, mining, and construction. This issue of Atlantic Geology highlights some examples of current studies in the region.

The volume begins with a paper by Wallace *et al.* discussing the makeup of carbonate mounds that occur in an area west of Cape Breton Island, Nova Scotia, where petroleum exploration is a contentious issue because of concerns for sea life habitat in an active fishing area. The carbonate mounds seem to be related to methane seepages, which confirm the alleged hydrocarbon potential, and at the same time the seepages are an integral part of the ecosystem of living organisms.

Atlantic Canada depends overwhelmingly on groundwater as a source of drinking water. Salinization of water supplies is often blamed on excessive pumping by neighbors or industrial users, which may have induced salt water intrusion of wells, especially in coastal communities. The paper by Giudice and Broster proposes that in some parts of New Brunswick, saline water from the Late Wisconsinan glaciation, which occurred approximately 14 000–12 000 years ago when many valleys were connected to the sea, has remained in pockets within the bedrock under the recharging freshwater. Thus even away from the coast, glaciated estuarine valleys may be especially at risk to salinization and must be protected from unrestricted exploitation.

Because glacial erosion has shaped so much of Atlantic Canada's landscape, one might expect that chemical weathering of the bedrock has been relatively insignificant since the last glaciation. However, as shown by O'Beirne-Ryan and Zentilli, Devonian monzogranite in many areas of Nova Scotia is deeply weathered. These authors describe three weathered horizons where saprolite (weathered rock) imparts unusual physical as well as geochemical characteristics to the bedrock, leading to varying element mobility to the surface environment. Exposure of these Carboniferous, pre-Triassic, and pre-Pleistocene saprolite occurrences to acidic precipitation and an oxygen-rich environment (due to lowering of the water table) may result in further release and migration of radioactive radon gas, uranium, and metals.

Petrunic *et al.* describe applications of analytical Transmission Electron Microscopy (TEM) in the geosciences,

which they use to study weathering reactions, metal sequestration during groundwater treatment, and measurement of iron valence ratios ($Fe^{3+}/\Sigma Fe$) in minerals. The main advantage of the analytical TEM is the ability to obtain images, chemical information, and electron diffraction patterns at the nanoscale. With such high spatial resolution, it is possible to observe physical and chemical features in samples that cannot be resolved with most other techniques. The authors review practical tips for sample preparation and analysis which allow analytical TEM measurements on a wide range of geological samples.

Over the last decade, studies of loons in the lakes of Kejimkujik National Park in southwestern Nova Scotia have shown that they contain the highest mercury concentrations in blood of any breeding loon population tested in North America. These findings have caused significant concern amongst scientists and the general public, and have led to numerous studies of mercury sources and cycling in Kejimkujik National Park. Both local geological sources and distal sources of airborne mercury pollution have been examined. Culgin and Goodwin report on the results of geochemical analyses of till and bedrock samples collected from three transects that cross the inferred contact between the Halifax and Goldenville groups immediately south of the Park. Their results show low concentrations of mercury in bedrock, and an order of magnitude higher concentrations in the overlying till, but do not reveal anomalously high concentrations that might help to explain the elevated mercury concentrations in loon blood.

In closing, we re-iterate a key point from the Preface of our previous "environmental" issue (Zentilli and Fox 1997): "prevention … (of environmental accidents) …will only be possible when the processes responsible for environmental degradation are fully understood." It is hoped that the interesting papers presented in this issue of Atlantic Geology are a further step in the right direction.

REFERENCES

Zentilli, M., & Fox, D. 1997. Geology and mineralogy of the Meguma Group and their importance to environmental problems in Nova Scotia, Foreword to Special Issue, Atlantic Geology, 33, pp. 81–85.