

GEOSCIENCE CANADA

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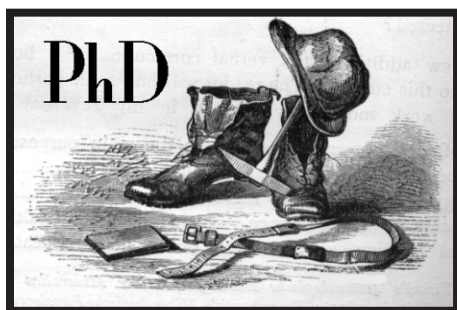
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ARTICLE



Doctorate Degrees Earned by Early Canadian Geologists

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SUMMARY

The first doctorate degrees in the geological sciences earned by Canadians were: Ph.D., Yale, 1871 by Bernard J. Harrington; Ph.D., Göttingen, 1877 by Joseph William Winthrop Spencer; Ph.D., Breslau, 1882 by Arthur P. Coleman; Ph.D., Johns Hopkins, 1888 by Andrew C. Lawson; Ph.D., Heidelberg, 1892 by Frank Dawson Adams; and Ph.D., Toronto, 1900 by William A. Parks. McGill and the Geological Survey of Canada were the two institutions that most encouraged Canadians to seek graduate-level qualifications. Yale had an important influence on McGill: its Sheffield Scientific School influenced William Dawson to set up the McGill Department of Practical Science, and he appointed Harrington to be its head. In the 1860s and 1870s, the Yale school

was the preeminent school in the United States for advanced study in geology and mineralogy, and the professors there encouraged many of their students to continue their studies in Germany: this advice was then taken up by McGill graduates, notably Spencer and Adams. By the 1890s graduate studies in geology had been developed to the doctorate level in many other American universities, so that travel to Germany was no longer necessary.

SOMMAIRE

Les premiers diplômes de doctorat en sciences de la Terre décernés à des Canadiens sont les suivants : Ph.D., Yale, 1871 à Bernard J. Harrington; Ph.D., Göttingen, 1877 à Joseph William Winthrop Spencer; Ph.D., Breslau, 1882 à Arthur P. Coleman; Ph.D., Johns Hopkins, 1888 à Andrew C. Lawson; Ph.D., Heidelberg, 1892 à Frank Dawson Adams; et Ph.D., Toronto, 1900 à William A. Parks. L'université McGill ainsi que la Commission géologique du Canada sont les deux institutions qui ont le plus encouragé les Canadiens à acquérir des qualifications universitaires de deuxième cycle. L'université Yale a eu une grande influence sur l'université McGill – c'est l'École scientifique de Sheffield (Sheffield Scientific School) qui a poussé William Dawson à créer le département de sciences appliquées (Practical Science) de l'université McGill, et c'est Harrington qui en a été le premier directeur. De 1860 à 1870, l'école de Yale était la plus importante école d'études avancées en géologie et en minéralogie aux États-Unis, et ses professeurs encourageaient plusieurs de leurs étudiants à poursuivre leurs études en Allemagne. Ainsi, plusieurs étudiants diplômés de McGill ont suivi ce conseil, notamment Spencer et Adams. Et, vers

les années 1890, des programmes d'études graduées de doctorat avaient été créés dans nombres d'universités étasuniennes, de sorte qu'il n'était plus nécessaire de s'expatrier vers l'Allemagne.

SERIES



Geology of Parliament Buildings 3. Building Stones of Ontario's Provincial Parliament Building

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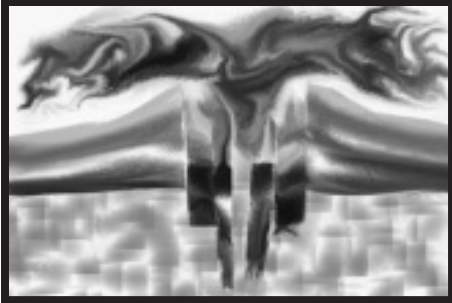
SUMMARY

Completed in 1893, Ontario's Parliament Buildings were designed to hold all the government and elected representatives' offices. Expansion of government services soon required the construction of several other buildings to house government offices. Using in its design mostly Canadian stone from Ontario and Quebec, the 1893 building was Toronto's first full Richardson Romanesque building. Partial reconstruction after a fire and the addition of a new wing combined to bring a variety of building stones to the site. A brief history of the building, and the properties of its stones – their strengths and weaknesses, is presented along with the result of a century of exposure to the city's weather, and the maintenance schedule underway to ensure another century of use.

Sommaire

Terminé en 1893, les édifices du parlement de l'Ontario avaient été conçus pour concentrer les bureaux de tous les députés. Par la suite, la multiplication des services gouvernementaux a nécessité la construction de plusieurs autres édifices pour héberger les bureaux gouvernementaux. Utilisant principalement des roches de l'Ontario et du Québec dans sa conception, les édifices de 1893 furent les premières constructions de Toronto du pur style romanesque Richardson. La reconstruction partielle après un incendie et l'adjonction d'une aile explique la variété des pierres de taille du site. Le présent article décrit brièvement l'histoire de l'édifice ainsi que les propriétés des pierres (leurs points forts et leurs points faibles étant analysés dans le contexte d'un siècle d'exposition aux intempéries de la ville), de même le programme d'entretien en cours visant à prolonger leur vie utile d'un autre siècle.

SERIES



A New Series on the Igneous Rock Associations of Canada

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The Volcanology and Igneous Petrology Division of the Geological Association of Canada is sponsoring a series of papers in *Geoscience Canada* on Igneous Rock Associations of Canada. The series is intended to provide informative articles on the diverse types of volcanic and intrusive igneous rocks to be found in Canada and to summarize modern interpretations of how different rock associations have evolved.

Igneous rocks form in response to large-scale tectonic processes. They require a delicate balance of temperature and pressure conditions such that pre-existing rocks of the upper mantle or crust can melt, a process that may be aided by addition of volatiles. The resulting magma requires a pressure gradient (usually buoyancy) and pathways in order to rise to higher levels in the crust or to be extruded. Although

some igneous rock appear to be distinctive of the Archean, in general the conditions for the formation of particular igneous rocks associations have reoccurred many times in different places throughout the history of the Earth. In Canada, we are fortunate in having outcrops of rocks formed at a wide range of levels in the crust, aiding the interpretation of entire igneous systems.

The evolution of magmas is a consequence of some fundamental principles of physics and chemistry. This evolution can be interpreted from an understanding of the processes of crystallization, the partitioning of elements between solid and fluid phases during partial melting and crystallization, the solubility of volatile phases, and the physics of magma chambers and magma pathways. Studies of mineralogy, petrology, geochemistry and structural setting of both active volcanoes and more commonly of crystallized igneous rocks, together with laboratory experiments and modelling, are the principal methods used to understand magma evolution.

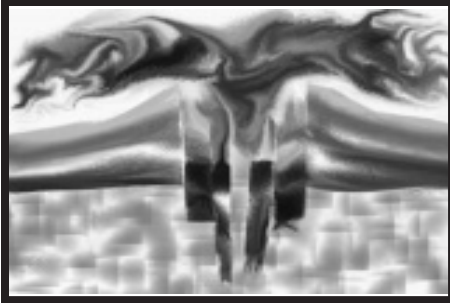
Igneous rocks are of course fundamental to all geology: without them, there would be no detritus to form sedimentary rocks and no protolith for metamorphic rocks. Even fossils are preserved in the weathering products of igneous rocks. Most ore deposits are a result either of direct igneous processes, or of fluids resulting from the crystallization of magmas, or of hydrothermal circulation driven by heat produced by magmatism. An understanding of igneous rock associations is thus important to the mineral industry. Igneous rocks are also important sources of aggregates and industrial minerals. In the far west of Canada, volcanic eruption is a potential geological hazard.

The papers in this series will deal with the principal associations of volcanic and intrusive igneous rock types and with topical issues in volcanology and igneous petrology. The first two papers in the series, by Ben Kennedy and John Stix, deal with the evolution of calderas in large volcanic centres. The study of recent calderas requires working outside Canada, but they are major structural and volcanological features of many ancient volcanic sequences and are commonly associated with mineralization. The next papers in the series will also cover volcanological topics. In all, about ten papers are currently identified for the series, but more would be welcomed.

Papers for the series should deal with an igneous rock association or a general issue in volcanology or igneous petrology. Each should summarize both the characteristics and the current interpretation of the genesis of the rocks. It should emphasize the current state of knowledge, avoiding lengthy historical review. Where possible, type examples from Canada should be presented. Illustrations should be of a high quality and the bibliography carefully selected to allow the general reader to follow up with the most useful and comprehensive literature. As with all *Geoscience Canada* articles, the papers should be aimed at a general geological audience and jargon should be avoided. Papers should normally not exceed 10 printed pages in length.

If you have any questions, or wish to contribute to the series as an author or co-author, please contact Georgia Pe-Piper, the series editor, at gpiper@smu.ca or Godfrey Nowlan, Editor, *Geoscience Canada*.

SERIES



Igneous Rock Associations 1. Styles and Mechanisms of Caldera Collapse

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SUMMARY

In this article, we summarize some of the most influential papers and concepts regarding caldera collapse. We also present a synopsis of the different types of calderas, their characteristics and field examples and provide a glossary of related nomenclature. We discuss piston, downsag, trapdoor, concentric step-down, chaotic, rifted and piecemeal calderas. Some calderas appear to be combinations of different types. We examine the complex interactions of variables that control the structure and morphology of calderas and result in a particular collapse style.

SOMMAIRE

Le présent article fait état des concepts et des publications les plus importantes en matière d'effondrement des caldeiras. On y présente également une vue d'ensemble des différents types de caldeira, leurs caractéristiques illustrées d'exemples concrets, ainsi qu'un glossaire de la nomenclature afférente. Nous traiterons des concepts de piston, d'affaissement, d'effondrement concentrique par paliers, ainsi que de caldeiras de style chaotique, de fossé tectonique et fragmentaire. Il semble que certaines caldeiras soient le résultat d'une combinaison de style. Nous considérons les interactions complexes de variables qui déterminent la structure et la morphologie des caldeiras et en conditionnent le style.