

Preface

What's New In The Canadian Edition?

Physical Geology and the Environment is a longstanding and well-trusted textbook that has been used by many thousands of students. This edition has been revised in response to the common observation that earlier versions lacked sufficient Canadian content to make the book attractive to professors and students working in Canada.

Much of the content of any introductory geology textbook is quite naturally concerned with descriptions of geological processes and products. It is possible, for example, to generalize about the workings of volcanoes, rivers, or glaciers worldwide. Nonetheless, the discipline of geology holds vital importance in the economic, social, and political realms of Canada, and it is for this reason that detailed references to Canadian examples have been incorporated into this new edition. Geology and geological processes have created the country's diverse resources and landscapes and have helped shape the varied human responses to them. The huge expanse of the Canadian Shield, the barrier of the Rocky Mountains, the Great Lakes, the Arctic barrens, and the cold coasts have all created unique environments. In turn, the discovery of natural resources and the ensuing gold rushes, oil booms, and access to deep prairie soils have all played a part in populating and developing the country. Currently, we are witnessing a modern-day diamond rush in the Northwest Territories that is stimulating geological exploration elsewhere. The search for oil and gas continues in the Arctic and Atlantic provinces. Whether we like it or not, as Canadians we are still economically dependent on our natural resources. Our future well-being depends on how well we can identify, protect, and efficiently extract additional new resources.

Another reason for a distinctive Canadian edition of *Physical Geology and the Environment* is that our society is growing increasingly concerned with environmental issues and geological hazards. Understanding and managing these issues requires an appropriate knowledge of our own geological history. Because we live on the surface of a dynamic planet where no place is fixed but always moving, Canadians must learn to live with hazards of landslides and earthquakes; as more and more Canadians live in cities, the risk from these events increases. Belying the postcard-perfect myth of wide-open spaces, Canada is increasingly an urban society: more than 80 percent of Canadians live in urban areas. As such, we face the challenge of keeping our lakes and rivers clean, safely disposing of wastes (ranging from household garbage to high-level nuclear wastes), and minimizing the impacts of a wide range of contaminants released into the air, water, and soil by industrial, urban, and agricultural activities. Understanding and managing many of these environmental impacts requires knowledge of the geology that underlies our cities. For example, much of our water moves in the subsurface as groundwater. Mapping and tracking its movement along with any contaminants that are present requires a geoscientist's skills and an understanding of both the bedrock and glacial geologic history of the area. Canada needs students with these skills, and this textbook is designed as a first step in the education of not only a new generation of geoscientists but also an informed populace.

Approach

We have reorganized the content of the book into four parts. **Part I** describes how planet Earth works on a large scale and describes the operation and significance of fundamental processes such as plate tectonics, earthquakes, and the Earth's internal heat engine. **Part II** examines the materials that make up our planet, including minerals, rocks (igneous, metamorphic, and sedimentary), soils, and the processes that create and deform these materials. **Part III** looks at the many dynamic processes that shape the surface of the Earth, including the actions of gravity, ice, water, and wind. The final section of the book (**Part IV**) examines the concept of geologic time and provides an overview of the geological history of Canada. This reorganization of content reflects our preferred approach to the teaching of physical geology—a systematic journey from the large-scale tectonic processes that shape the body of our planet to those that affect and change its surface characteristics. We have also included examples of environmental geological applications wherever possible to demonstrate the importance of physical geology to modern society.

We have added Canadian content to the text through Canadian examples that are inserted directly into the text, highlighted as feature boxes, or included as new diagrams and photographs. This allows students to better understand the importance of global issues and geological concepts by referring to the Canadian examples they are familiar with. It will also help them gain a better understanding of the geological wealth and diversity of the country in which they live.

The second—and perhaps most important—addition is a new chapter on the geological history of Canada (chapter 20). This improvement is significant for many reasons, not least the fact that Canada still depends on natural resources for much of its economic well-being. The Canadian Shield, formed between 3,500 and 1,000 million years ago, is the largest and oldest shield in the world, and hosts a wealth of geological resources such as gold, zinc, and nickel. Much that can be learned about the geology of Canada can be applied globally. This is well illustrated by the Lithoprobe project, which aims to understand the origin and mineral wealth of the shield and adjacent mountain belts (chapter 4). Canadian expertise in finding minerals deep in the shield is being employed worldwide.

Finally, we have added frequently asked questions to the title page of each chapter. Educators today are encouraged to use inquiry-based teaching methodologies, whereby students formulate research questions, find data to answer or explore those questions, and communicate the results of their investigations to others. The addition of questions to the beginning of each chapter is intended to stimulate students to create their own questions.

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