

# A MILESTONE IN CANADIAN GEOLOGY !

## Four Billion Years and Counting: Canada's Geological Heritage.

By

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**Notes on a beautiful new book, accessible to a wide audience,  
first published in October, 2014**

*Great value for \$40 – ask your bookseller or see:*

<http://www.nimbus.ca/Four-Billion-Years-and-Counting-P6855.aspx>

MINLIB keyword summary...

MINLIB 1/4: **A spectacular softbound review, for non-specialists and geologists alike, of the geology and geological evolution of Canada** - *the book, in 20 chapters (plus an extensive index) contains of hundreds of colour illustrations, with one or more colour photographs, charts, maps and paintings on almost every page* - the project was 7 years in development, with a cast of hundreds (the editors / authors / contributors include many of GSC affiliation) - the book is printed in a generous 24x30 cm format, on good paper, and weighs 1.76 kg (my only worry is that the binding may not survive heavy use in a library setting: perhaps a hardbound version will follow) - the introduction notes that Canada has an area of almost 10 million km<sup>2</sup> and a coastline some 202,000 km long - 1) the rock cycle - geological time - Niagara Falls, Ontario - magmatism - columnar basalts of Mount Garibaldi, BC - igneous rocks - sedimentary rocks - sedimentary structures - coal - soil - metamorphic rocks - tectonics - minerals - the structure of the Earth - 2) the dynamic Earth - plate tectonics - marine geology and geophysics - sea-floor spreading - world map of tectonic plates today (p.29) - colour cartoons of mid-ocean rifting and subduction zones - magmatism - ophiolites in Gros Morne park, Newfoundland - 3) geological time scale - stratigraphy - relative and absolute ages - age dating - fission track dating - <sup>14</sup>C age dating - dendrochronology - conodonts - with a section on mapping, field geology, remote sensing and airborne geophysics - 4) fossils - history of science - Joseph Tyrrell - examples of fossil plants, invertebrates, trace fossils, etc - taxonomy - bacteria - microfossils - Isotelus, Ordovician trilobite from Bowmanville, Ontario - Silurian eurypterid from the Ridgemount area, Ontario (p.57) - colourful ammonite in Cretaceous ammonites from Alberta - Mucrospirifer, a brachiopod from Arkona, Ontario - graptolites and vertebrate remains from sites in Nova Scotia - Joggins - VPal - dinosaurs - mammals - extinction events - paleoclimatology and the evolution of the atmosphere - Precambrian BIF (Temagami) and Permian redbeds (Prince Edward Island) - geomorphology -

MINLIB 2/4: geological evolution of Canada: 5) the early Earth - the early solar system - the Madoc iron meteorite (p.76) - Earth and Moon - Moon rocks and the Archean on Earth - Archean cratons - komatiites in Quebec and on Baffin Island (Nunavut, NWT, Arctic Canada) - the Slave and Superior cratons - pillow lavas - greywacke metasediments - field geology - stromatolites - BIF (Sherman mine, Temagami, Ontario) - 6) the Proterozoic - history of science - Stanley Tyler's 1953 discovery of microfossils in the 1900 Ma Gunflint BIF - maps, paleogeography - mafic dykes near Saglek Fiord, Labrador, Newfoundland - cartoon of the distribution in time of BIF and redbeds and stromatolites (p.88) - conglomerates and glacial tillite near Elliot Lake, Ontario - Killarney Park - the Southern province - the Cumberland batholith on Baffin Island - Belcher Islands in Hudson Bay (northwest Quebec) - the Grenville province - Coppermine basalts near Kugluktuk, Nunavut - cartoon map of the supercontinent of Rodinia (p.97) - 7) latest Proterozoic and Cambrian time - Avalonia - Iapetus ocean - Ediacaran fauna such as Charniodiscus, at Mistaken Point, Newfoundland - dropstones - the Snowball Earth hypothesis - rise of animal life and the Cambrian Explosion - archaeocyathans from southern Labrador - terrane maps - metasediments of the Meguma terrane near Lunenburg, Nova Scotia - mafic sills of the Franklin dyke swarm, NWT (p.111) - Paleozoic sedimentation in BC - turbidites near Charny, Quebec - cartoon of Laurentia (p.117) - graptolites near Wolfville, Nova Scotia - largest-known trilobite, an Isotelus from Churchill, Manitoba (p.119) - straight-shell nautiloid in Tyndall Stone from Garson, Manitoba - stromatolites at Gatineau, Quebec - Walcott and the Burgess shale of BC (pp.122-125) - paleoecology - paleobotany and the rise of plants and trees (pp.126-129) - 8) the Silurian, Devonian, Carboniferous and Permian - cartoon of eurypterids (p.135) - the Michigan basin in Ontario and the USA - Prince Leopold Island - Miguasha park in the Gaspé region, Quebec -

MINLIB 3/4: sedimentary basins - coal - energy resources - 9) breakup of Pangea - the Triassic, Jurassic and Cretaceous periods of the Mesozoic era - landforms - geomorphology - the late Triassic around the modern Fundy basin, Nova Scotia - opening of the Atlantic ocean - Laurentia - the Tombstone Range, Yukon - Wrangellia - the Rocky Mountains - BC and Alberta - the Monteregean Hills of Quebec - dinosaur fossils, Alberta - VPal - the KT impact event and mass extinction (pp.187-188) - evolution and the rise of mammals (pp.189-191) - 10) Tertiary geology - coal and plant fossils from Nunavut, NWT, Arctic Canada - Axel Heiberg Island - plate tectonics and paleogeography - structural geology - plant fossils from the Eocene at Quilchena, BC - recent volcanism and tectonism - Mount Logan, Yukon - Mount Waddington, BC - paleogeography of the Arctic archipelago - paintings of camels on Ellesmere Island (p.213) and of fauna near Wood Mountain, Saskatchewan, in the Miocene - VPal - 11) the Ice Age - Quaternary geology and glaciation - Don Valley brickworks, Toronto, Ontario (p.217) - Scarborough Bluffs - giant beaver, ground sloths and other extinct forms - glacial striations and other glacial landforms - Mount Assiniboine - glacial deposits - varves - pingos - patterned ground near Woodstock, Ontario - Ring Mountain tuya near Whistler, BC - glacial lakes in Canada and around the Great Lakes (p.233) - the short-faced bear - mammoth - arrival of humans via Beringia (pp.234-239) - climate and natural hazards (pp.240-244) - a third section concerns "wealth and health": 12) mineral deposits and economic geology - brief notes on VMS, sedex and MVT Cu Zn Pb

deposits, granite-related Sn deposits - Sudbury impact-related Ni Cu PGE ores (pp.252-254) - Au deposits - Fe deposits - diamond deposits - history of mining - 13) energy resources - coal deposits - Cape Breton Island, Nova Scotia - Sparwood, BC - organic geochemistry and the origins of petroleum - hydrocarbon traps - Leduc oil field, Alberta - Turner Valley - oil sands (tar sands) - nuclear power - renewable energy -

MINLIB 4/4: 14) building materials - industrial minerals - urban geology - ornamental stones - architecture - Banff and Lethbridge, Alberta - Tyndall Stone in Saskatoon, Saskatchewan - sedimentary rocks - igneous rocks - Vancouver, BC - Ottawa - anorthosite with labradorite feldspar from the Nain area of Labrador, Newfoundland - metamorphic rocks - aggregates, clay and concrete - an essay on the use of stone in Quebec City (pp.292-297) - 15) water resources - agriculture - water and ice - aquifers - Oak Ridges moraine of southern Ontario - glaciers - the hydrologic cycle - irrigation - reservoirs - 16) the coast of Canada (pp.307-319) - sea level change - coastal landforms - raised beaches - the Mackenzie delta of Yukon and NWT - estuaries, mud flats and marshes - 17) natural hazards - landslides - earthquakes, seismology, geophysics, geodesy - tsunamis, volcanic eruptions and floods - meteorites and impact events (pp.333-337) - Prince Albert impact structure, Victoria Island, NWT, Arctic Canada - Manicouagan, Charlevoix and Pingualuit, Quebec - shatter cones - 18) environmental geology - pollution and water supply - garbage, landfills and recycling - abandoned mine sites - mine tailings - Britannia mine near Squamish, BC - hydrology and contaminant tracing - remediation - 19) - unseen natural hazards: toxic elements in the Earth's crust - Se - Cd - arsenic - Hg - Rn - volcanic dust - asbestos - 20) geological heritage of Canada - komatiites on Baffin Island - Ellesmere Island - schematic time charts of orogenies, oceans, continents, etc - landscapes - fossils - detailed summary time chart (pp.374-375) - thankfully, the many topics and images in the book are treated by a 22-page index, completing a unique reference work

(footnote, photographs by GCW: marble from the Grenville province near Bancroft, Ontario, p.16 - boulder field near Steepledge Lake, p.47 and Sibley sediments cut by Keweenaw sills on Hwy. 17, p.96 [both in Thunder Bay district, Ontario] - zoned crystals of Nanisivik sphalerite, Baffin Island, Nunavut, p.249).

