

Great Canadian *Lagerstätten* – The Series

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Volume 38, Number 4, December 2011

URI: https://id.erudit.org/iderudit/geocan38_4ns01

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Publisher(s)

The Geological Association of Canada

ISSN

0315-0941 (print)

1911-4850 (digital)

[Explore this journal](#)

Cite this document

Rudkin, D. & Young, G. (2011). Great Canadian *Lagerstätten* – The Series. *Geoscience Canada*, 38(4), 154–154.

NEW SERIES

Great Canadian *Lagerstätten* – The Series

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The fossil record is immense. Considered as a whole, it is an astounding array of organic remains, making up the raw data for our reconstruction of the history of life on this planet. Although it is undeniably a fragmentary dataset, deeply biased in its representation of biological and ecological diversity, scientists have yet managed to extract from it the framework of a compelling story that spans more than three-and-a-half billion years.

Arguably, the most fascinating and important insights into this unfolding tale have come from what may be regarded as its rarest components: disjunct fossil occurrences in which the interruption of natural degradation pathways has permitted preservation of remains of exceptional anatomical detail, biological diversity, or abundance. Such extraordinary fossil deposits have come to be known as *Lagerstätten* (sing. *Lagerstätte*), from an archaic German mining term that is often translated as 'motherlode'. The circumstances under which *Lagerstätten* formed are the subject of taphonomy – literally 'burial law' – a branch of paleontological investigation that focuses on the sum of processes operating on an organism from death

through ultimate destruction, or preservation. Under the unusual and highly favourable taphonomic conditions that give rise to *Lagerstätten*, even the most delicate organisms or easily decomposed soft tissues may survive in recognizable form, yielding a wealth of information missing from the conventional record of biomineralized hard parts.

Canada's enviable *Lagerstätten* inventory includes the Ediacaran Mistaken Point Biota of Newfoundland, the Cambrian Burgess Shale of British Columbia, and the Cretaceous dinosaur bone beds of Alberta, all of international scientific and popular renown. But the list is actually much more extensive. *Lagerstätten* are spread across our country, with representation in nearly all provinces and territories, and through geological time from the Proterozoic to the Recent. They encompass sites in which the fossils include soft parts that are elsewhere lost to the dark forces of decay and time (properly termed *Konservat-Lagerstätten*), and places where the type of preservation is not unusual, but where the fossils may be breathtakingly abundant (i.e. *Konzentrat-Lagerstätten*).

Manuscripts currently in preparation for this series cover such topics as life forms on hostile Ordovician shorelines of Manitoba, Silurian 'sea scorpions' from southern Ontario, and diverse Triassic marine creatures from northern British Columbia. We invite you to join us in the coming months for a tour through these splendid Canadian treasure vaults, these windows through which we view long-past creatures and ecosystems. Your tour begins with a pair of contributions focusing on opposite ends of the Phanerozoic time scale. Harvey and Butterfield reveal exquisitely preserved

fossils of 520 million-year-old Cambrian marine animals, including the microscopic feeding apparatus of early crustacean arthropods, from surface and borehole samples of the Mount Cap Formation in the Northwest Territories. Eocene *Lagerstätten* of the Okanagan Highlands of British Columbia are the subject of a review by Archibald et al., featuring wonderful fossil sites where you can sometimes see colour patterns on insect wings, cell patterns on leaves, and the delicate structures of flowers, all on remains of organisms that lived about 50 million years ago!