Revised Chronostratigraphy of the Cambrian System in Subsurface Ohio

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Abstract

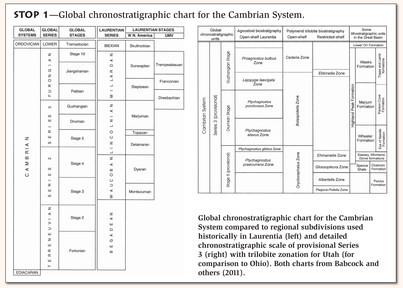
In recent years, the search for new hydrocarbon reserves, some of them in unconventional plays, and strata that could serve as targets for CO_2 sequestration have helped refocus attention on the Knox and pre-Knox (Proterozoic-Cambrian) stratigraphy of the Appalachian Basin region of North America. A consideration central to interpretation of the economic potential of Cambrian strata in the subsurface of eastern and midwestern North America is the age and facies relationships of these rocks.

Historically, two problems have impaired our ability to discern age relationships of Cambrian strata in subsurface Ohio and adjacent areas: (1) few biostratigraphic and other recognized chronostratigraphic indicators; and (2) reliance on outmoded time-stratigraphic models. With new information bearing on both of these issues we are now able to take a few steps forward in resolving the generalities of time-stratigraphic relationships in the Cambrian of Ohio.

The International Subcommission on Cambrian Stratigraphy (ISCS) has recommended a new global standard for Cambrian chronostratigraphic nomenclature that eliminates many of the ambiguities surrounding the assignment of North American rock units to various regional "standards." The global model subdivides the Cambrian into four series and 10 stages. Although not all series/epochs and stages/ages of the Cambrian System/Period have not yet been defined, those that have been ratified can be correlated precisely in most areas of the world using multiple chronostratigraphic guides.

So far, age relationships of Ohio's subsurface strata are based mostly on trilobite biostratigraphy, meaning that heavy reliance is placed on the chance discovery of recognizable remains in drill cores. Based on available evidence, most, if not all, of Ohio's subsurface Cambrian is limited to provisional Series/Epoch 3 through the Furongian Series/Epoch. A new, incomplete exoskeleton recovered from the Mt. Simon Formation is consistent with an age of provisional Epoch 3 (probably Guzhangian). The oldest, previously recognized trilobite, *"Cedaria" woosteri*, from the Eau Claire Formation, suggests an age of Epoch 3 (Guzhangian Age). Sclerites recovered from the lower part of the Knox Dolomite, including *Crepicephalus*?, *Aphelaspis*?, and *Elvinia*?, indicate that this part of the Knox is of Furongian age.

STOP 1—Global chronostratigraphic chart for the Cambrian System.


GLOBAL SYSTEMS
GLOBAL SERIES
GLOBAL STAGES
LAURENTIAN SERIES
LAURENTIAN STAGES
Global chronostratigraphy
Agnostoid biostratigraphy
Polymeroid trilobite biostratigraphy
Some diagnostic units in the Great Basin
CAMBRIAN
ORDOVICIAN
LOWER
MIDDLE
UPPER
Furongian
Paibian
Guzhangian
Drumian
Stage 5
Stage 4
Stage 3
Stage 2
Fortunian
Stage 10
Jiangshanian
Furongian
Steptoean
Marjumian
Topazan
Delamarian
Dyeran
Montezumian
Trempealeauan
Franconian
Dresbachian
BIDWYAN
SUNWAPTAN
DRUMIAN
SPENCER
TOMBY
DYER
MONTEZUMA
Cordilleran Miogeocline
Laurentian Craton Interior
Bristol Hill
Dunderberg
Hellnmaria
Orr Formation
Weeks Formation
Marjum Formation
Whirlwind Formation
Kinderhook Shale
Pierre Formation
Wheeler Shale
Pioche Formation
Global chronostratigraphy
Agnostoid biostratigraphy
Open-shelf Laurentia
Polymeroid trilobite biostratigraphy
Open-shelf
Restricted shelf
Great Basin Formations
Upper Cliff Formation
Nopah Formation
Dunderberg Shale
Emigrant Formation
Pioche Formation
Pogonip Group
Eureka Quartzite
Ely Springs Dolomite
Goodwin Limestone
Dunderberg Shale
Hellnmaria Member
Orr Formation
Weeks Formation
Marjum Formation
Wheeler Shale
Pierre Shale
Corynexochid Biozone
Ptychoparioid Biozone
Saukiid-Cambraster Biozone
Proagnostus bulbus Zone
Lejopyge laevigata Zone
Ptychagnostus punctatus Zone
Ptychagnostus atavus Zone
Ptychagnostus gibbus Zone
Ptychagnostus atavoides Zone
Cedaria Zone
Elrathia Zone
Ehmaniella Zone
Glossopleura Zone
Albertella Zone
Peltura-Parabolina Zone
Crepicephalus Zone
Aphelaspis Zone
Dicellocephalus-Dicellocephalina Zone
Cambrian Systems
Cambrian Series
Furongian Series
Furongian Series
Furongian Series
Series 3
Series 3
Series 3
Series 2
Series 2
Series 2