

## REVIEW

*Cambrian of the New World* (V. 1. *Lower Paleozoic Rocks of the World*); edited by C. H. HOLLAND; P. 456, num. figs. London, 1971 (John Wiley and Sons, Ltd., \$29.00).—In these days of plate tectonics and renewed acceptance of continental drift, syntheses of Paleozoic stratigraphic data are of greater importance than ever. Facts from the new oceanographic work that support such hypotheses offer evidence only back to 150 m. y. or so, and eventual discovery of pre-Mesozoic sediments in the ocean basins begins to appear unlikely. Our views of pre-Triassic continental positions, world paleogeography, and paleoclimates must continue to come from such compilations as *Cambrian of the New World*, a synthesis of the vast amount of data derived from study of sediments on continental areas and surrounding geosynclines. The editor of the series *Lower Paleozoic Rocks of the World* is to be congratulated for commencing his herculean task by making use of the extensive knowledge of several highly qualified authorities on the Cambrian. (Review papers are a kind of labor of love, and their authors and editors should be thanked. Time spent in compiling and editing scattered information in a given field may cut seriously into on-going research.)

The following chapters are included in the volume:

1. Cambrian of the Great Basin and adjacent areas, western United States, Allison R. Palmer, State University of New York at Stony Brook, N.Y.
2. Cambrian of the craton of the United States, Christina Lochman-Balk, New Mexico Institute of Mines, Socorro, N.M.
3. Cambrian of the Appalachians and Eastern New England regions, eastern United States, Allison R. Palmer.
4. Cambrian of Canada and Alaska, F. K. North, Carleton University, Ottawa, Ontario, Canada.
5. Cambrian of North American Arctic regions, J. W. Cowie, University of Bristol, England.
6. Cambrian of South America, A. V. Borrello, National University of La Plata, Argentina.

The above chapters vary from 50 to 100 pages in length. Each has its own table of contents. Lithologic and biostratigraphic documentation is sufficiently detailed; the text is well written and edited, and a satisfactory index is included. Adequate stratigraphic diagrams and maps permit a handy overview so that the hurried reader need not get lost in detail. The photography, line drawings, and typography are good.

To summarize directly the contents of such a massive reference is somewhat like reviewing Webster's Dictionary. The present writer, therefore, can do no more than point out what to him are some of the meaningful conclusions and interesting implications derivable from these excellent papers.

A. The eastern Canadian Arctic island and Greenland sections reviewed by Dr. Cowie contain a persistent regional unconformity encompassing the whole Upper Cambrian. Western sections in the Canadian Arctic contain a pronounced pre-Franconian disconformity—a situation

prevailing for several thousand miles southward across the whole North American craton all the way into Texas and New Mexico. This widespread period of marine regression is represented even in the Great Basin by a ubiquitous shale unit. One may infer that an uplift responsible for this great regional disconformity was centered in Greenland or in the North Atlantic and that geographic extent of the disconformity thus offers some evidence for its tectonic origin and argues against a eustatic cause.

B. Using an actualistic approach, one may surmise that great carbonate banks, redbeds, and evaporites lie along belts paralleling and relatively close to the equator, the former being tropical to subtropical in position, the latter belonging to latitudes from 15° to 40° north and south. From the information compiled by Drs. North and Palmer, one discerns thick carbonate deposits along both Appalachian and Cordilleran geosynclines from the latitudes of Alabama and southeastern California to far north in the Arctic. Apparently, even the northerly Franklinian trough contains perfectly good algal stromatolitic limestones and thick carbonate beds. We are at this time too ignorant of the positions of cratonic areas in Paleozoic times relative to present-day poles to relate the ancient equatorial position of North American Cambrian carbonate banks to comparably thick carbonate strata in Morocco and Manchuria, but it is clear that both North American and Asiatic/African Cambrian carbonates cut drastically across modern latitudes. The same arguments are furnished by considering positions of Lower to Middle Cambrian evaporites. Dr. North's chapter locates some of these deposits in the Canadian Arctic archipelago. It is well-known that Cambrian salt deposits also lie far north in Siberia, and as well in the Salt Range of Pakistan, and throughout the eastern Persian Gulf, the trends of the basins cutting across the present day latitudes 15° N to 65° N. Thus stratigraphic evidence of equatorial deposits shows that Cambrian polar positions may have been clearly different from those of today.

C. Probably the most valuable contribution of the volume to regional stratigraphy is that it gives details supporting more precisely the delineation of the tectonic and faunal boundaries between extracratonic, transitional, and cratonic faunas of the Cambrian, particularly in the Arctic and Acadian areas of North America. (Note the map of Newfoundland on page 253 of North's chapter.) Paleogeographers should note with interest that a sharply defined tectonic boundary existing at the margin of ancient geosynclines in both Newfoundland and Argentina coincides with changes in almost identical faunas in these areas. If one now plots the rare occurrences of Cambro-Ordovician olenid and paradoxidid trilobites in the New World, they are clearly extracratonic around the Canadian shield, trend south through Oaxaca, Mexico, the eastern cordillera of Colombia to the eastern Andean margin in Bolivia and northern Argentina to the Precordillera of the Mendoza region of Argentina. Borrello has made a particularly significant contribution in offering finally, in English, geographic, stratigraphic, and structural data on the disposition

of Cambro-Ordovician "North American" faunas of Mendoza-San Juan areas of Argentina described somewhat earlier by Rusconi. These appear to be certainly transitional between a craton and geosynclinal trough in South America, comparable in paleogeographic position to identical faunas in North America.

D. Masterful summaries of cratonic and geosynclinal stratigraphy and faunal sequence in the United States portion of North America are presented by Lochman-Balk and Palmer. Both authors have up-dated and amplified their previous reviews published in 1956 in the Cambrian Symposium volumes of the 20th International Geological Congress in Mexico. These useful compilations offer basic data for paleotectonic interpretations. Cross sections, facies, and paleogeographical maps are presented in both papers (Lochman-Balk, p. 95-103, and Palmer, p. 62, 63, 66, 67). Neither author presents isopach maps which would have been most helpful in paleotectonic study, but the basic data are available, and the biostratigraphic framework is sufficiently precise for the reader to construct his own maps and to make meaningful structural interpretations.

Palmer's concept of inner detrital, carbonate bank, and outer detrital belts encircling the craton and lying in sequence outward into the Appalachian and Cordilleran geosynclines is a useful generalization, and the reviewer agrees with his suggestion that "recognition of such major lithofacies belts is a necessary first step in ecological interpretations of the contained trilobite faunas." Recognition of significant carbonate bank and shelf margin facies in the Cambrian is just now becoming clear. The biological make-up of such massive carbonates and the exact litho- and biostratigraphic relations between the banks and the dark shales of the outer detrital belt offer problems for future study.

One of the intriguing tectonic problems pointed up by Lochman-Balk's cratonic review is the antiquity of the two parallel east-west transverse lineaments, the Rough Creek fault zone across the southern Illinois basin, and the thick early Cambrian deposition along the southeastern edge of the Anadarko trough. The sudden thickening of the basal Paleozoic sands along fault scarps into the Illinois basin and the Eocambrian volcanics and graywackes drilled by wells along the Wichita-Red River uplift clearly indicate considerable subsidence along these trends in the beginning of the Paleozoic. Do the Mississippi embayment and the present outcrops of the Ouachita Mountains overlie an Early Cambrian geosyncline that existed west of the Nashville Dome, southeast of the Ozark dome and Hunton arch, and separated the Texas craton from the older Precambrian granite basement in Oklahoma?

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