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Comparative Values of Different Methods of Geologic Correlation in the Mississippi Basin

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Considering in this light the cherts of the Missouri mineral belt in the southwestern part of the state similar conditions appear to have prevailed. The calcium carbonate of the fossils is found entirely replaced, one end only replaced, or only a small part replaced, by chert. A similar replacement also takes place in which iron sulphide is substituted for the original material of the fossils. Likewise zinc sulphide, the principal ore of the district, is found composing fossils as perfectly as in the original, every structure being perfectly preserved.

From these facts, and many others, no other conclusion can be reached but that the cherts were formed long after the terranes were laid down; that the cherts were formed under the same conditions as the ores of the region, and that, like the ores, the cherts were formed at a comparatively recent date; that, as in the case of the ores, the cherts were formed by the displacement of the original limestone molecule by molecule.

The formation of the ores of the region is going on rapidly at the present time. The last uprising of the Ozark dome is not believed to be yet finished. The formation of ore and chert is manifestly very recent, geologically speaking. It is not impossible, but not probable, that the whole transformation may have taken place within the memory of man.

COMPARATIVE VALUES OF DIFFERENT METHODS OF GEOLOGIC CORRELATION IN THE MISSISSIPPI BASIN.

BY CHARLES R. KEYES.

(Abstract.)

The need of a number of independent criteria in the broader work of geologic correlation has never been more apparent than at the present time. Yet for necessary

reasons geologists have been slow in applying in the field what they have been convinced of in their theoretical musings.

In those cases in the Mississippi valley in which several correlative tests have been made simultaneously, some very instructive features have been disclosed. A paper on the results of one of their multiple tests was read before the Academy last year, and a more extended memoir, on a closely similar topic was also read before the Geological Society of America, entitled the "Devonian Interval in Missouri."

In geological correlation the most important of the criteria which have been most generally employed may all be assigned to two main groups, the biological, or biotic, and the physical. At one time or another each one of the subordinate methods of both groups has been made all-decisive in the various plans of geological work. At the present time all of these are used to some extent, either directly or indirectly. These minor methods have been recently arranged by Gilbert in the following way:

- I. Physical, through
 - (1) Visible continuity.
 - (2) Lithological similarity.
 - (3) Similarity of lithological sequence.
 - (4) Unconformities.
 - (5) Simultaneous relations of diverse deposits to some physical event.
 - (6) Comparison of changes deposits have experienced from the action of geological processes supposed to be continuous; and
- II. Biotic, through
 - (7) Relative abundance of identical species.
 - (8) Relative abundance of allied or representative species.
 - (9) Comparisons of faunas with present life.
 - (10) Relations of faunas to climatic episodes.

With possibly one exception, all the methods of correlation which are included in the two principal categories are strictly local in their scope, though it is the custom to

regard them as applying widely, if not universally. For many years general correlations have been carried on almost entirely by the biotic methods. At the present time they predominate over all others, and are, in fact, the foundation of our commonly accepted system of geological synchrony.

It is beginning to be recognized more and more clearly that organic remains are not the all-deciding factors in questions of correlation; that they are, in reality, merely accidental characters, and that when depended upon they must always be, and are in fact, taken in connection with physical features.

In the Mississippi valley not nearly enough detailed work has yet been done on the fossils to enable exact correlations to be made through the faunas alone. Were it not for the adoption of other and independent methods of correlation, the strata of the region, so far as the paralleling of the different vertical sections is concerned, might for a long time remain in a very unsatisfactory condition.

In the correlation of these strata five distinct methods have been made use of. In consequence, the results obtained by one method have been checked by those arrived at through other independent data. In this way, marked discrepancies in the readings of one set of records have been detected and corrected. The values of the several methods have been quite different in different localities, but when all could be applied in a single district the comparative results have been full of interest. This has been particularly notable in the case of northeast Missouri, in the area occupied by the original Kinderhook.

In order of their practical values in the field work in this district these five methods are similarly of lithologic sequence, lithologic similarity, faunal comparison, orotaxis, and homogeny.