

HOW TO EXPRESS TIME IN GEOLOGY*

FRANS E. WICKMAN

Department of Geochemistry and Mineralogy,
Pennsylvania State University, University Park, Pa. 16802

ABSTRACT. It should be convenient to have a time expression for each power of 10 years in geology. The following terms, based on the SI and the historic time scale, are suggested (length of time in years – name): 1 – (annus) year; 10 – (decennium) decade; 10^2 – (centennium) century; 10^3 – millennium; 10^4 – dekamillennium; 10^5 – hectomillennium; 10^6 – megennium; 10^7 – dekamegennium; 10^8 – hectomegennium; 10^9 – gigennium. The use of such units could make discussion of geological events shorter and clearer. The megennium might be introduced as the standard time unit for pre-Pliocene geology; that is, ordinarily it would only be necessary to use figures, the time unit being implied by the subject.

The relative geologic time-scale, divided into periods of very varying duration, represented a large step forward at the time of its introduction; however, it was abstracted from scanty data. More detailed mapping on a world-wide basis has shown that no sharp, self-evident boundaries seem to exist between consecutive periods. The same is true for eras and epochs. National and international commissions therefore have been formed to formulate agreements on the boundaries between the stratigraphic time units, in order to remove the ambiguities of nomenclature. The present—and still more the future—possibility of dating rocks and geologic events in years has radically changed the problem, especially since a Precambrian stratigraphy is developing rapidly.

Chronologic nomenclature is no monopoly of geology; in fact, all branches of history and archeology must use one. These disciplines long ago established ways of handling all kinds of time expressions.

When writing in English the historian frequently uses the words decade, decennium, century, and millennium, that is, he has at least one word for each power of ten years. Geologists lack this kind of nomenclature, but if they had one, it would contain nine powers of ten years because of the much longer time scale. In what follows such a nomenclature is proposed and briefly discussed. The complete list of proposed terms is

Years	Terms
1	(<i>annus</i>), year
10	(<i>decennium</i>), decade
10^2	(<i>centennium</i>), century
10^3	<i>millennium</i>
10^4	<i>dekamillennium</i>
10^5	<i>hectomillennium</i>
10^6	<i>megennium</i>
10^7	<i>dekamegennium</i>
10^8	<i>hectomegennium</i>
10^9	<i>gigennium</i>

* College of Earth and Mineral Sciences, Contribution No. 67-41.

The list is based on the Latin word *annus*, year, combined with a prefix, and it is obvious how it can be expanded. The first three powers differ in derivation from the rest: the terms are identical with the words of colloquial language. The word *centennium* is used for century in some languages, and it has therefore been listed. There is no reason for the geologist writing in English to deviate from the every-day use of decade and century.

No suitable Latin numerals for higher powers of ten exist. The terms have therefore been derived according to the SI rules for forming multiples of units. (The SI is the international system of units.) It is unfortunate that in SI the Greek numerals are used for multiples and the Latin ones for submultiples, or reversed from the first three powers in the list above. Such a mixed system must ordinarily be avoided, but the present case is unique, since on old, established terminology already exists. It would be folly to introduce new terms when the old ones cannot be misunderstood. But it would also be folly to introduce new special prefixes differing from those in SI. The method used seems therefore acceptable to me. The new terms have a mixed linguistic origin, but since we use terms like centimeter it is no strong argument against them.

The best way to judge the new terminology is to apply it. We can write, for example, "in the megennium 1731" in analogy with "in the year 1731". This brings up the question whether it would not be practical to adopt the megennium as the "geologically legal" time unit for pre-Pliocene geology. It would then only be necessary to write or say "in 1731", the unit megennium being implied by the subject. An obvious objection to this suggestion is that in most lectures and papers both systems of time units would occur simultaneously, resulting in a confused reader or listener. If the speaker or writer uses normal caution, this danger is negligible, however, since the ordinary system only refers to persons and papers and the other system only to geologic events and ages of rocks. If the megennium is a good time unit for pre-Pliocene geology, which units would then be appropriate for the remaining interval? The year is the obvious answer for the last few dekamillenia. For the remaining time interval the answer is not that simple. It would seem that the millennium had the suitable length of time considering the presently obtainable accuracy of age measurements in that time interval. However, the symbol presents a problem, and in order to avoid confusion it is, at least temporarily, best to use the year.

The list of time units was prepared with other time expressions in mind, which are most easily described with the help of some examples. I have therefore made a small list that illustrates some of the possible applications. No special effort has been made to make the geologic content of the sentences correct, since they are merely illustrations of the possible use of the time units suggested above.

"The third dekamillennium was a period of vast glaciation".

"Geologists have expressed different opinions regarding the hectomillennium in which the Nebraskan glacial occurred".

"Volcanism was common during the second megennium in the High Cascades".

"The boundary between Tertiary and Cretaceous is usually drawn at the end of the 7th dekamegennium".

"The North Atlantic may have opened sometime during the beginning of the first hectomegennium".

"The formation of a mountain chain seems to take a few dekamegennia at most, whereas geosynclines may exist for hectomegennia".

"During the first dekamegennia of the 18th hectomegennium large-scale migmatization occurred in Central Sweden.", or simply

"In the 1790's and 80's large-scale migmatization occurred in Central Sweden".

"Very little is known about the Earth's history during the fourth gigennium, because little seems to be preserved from this period of time".

At a first reading of these examples the names of the time units may present difficulties, but in my opinion they are easy to remember and use. They should also be useful in stratigraphy, since they eliminate the need for rigorous definitions of the boundaries between chronostratigraphic units. Instead, terms like Silurian and Mesozoic can be used in the same way in geology as concepts like Renaissance and Middle Ages are used in history. There is no need to find universal features that can serve as boundary lines.

A critic may remark that our present knowledge of the absolute chronology of the Earth's history is scanty and inaccurate. Consequently the suggested system will create all kinds of confusion. In my opinion it will mainly have the reverse effect, because it becomes easier to adjust to the proper accuracy by using a time interval of suitable length. In other words, it promotes sound time boundaries in discussions of geologic events and age data, and it does not invite people to pigeonhole matters that are not suitable for a rigid classification system.

ACKNOWLEDGMENTS

I am greatly indebted to Dr. A. Martinsson, Uppsala University, Sweden, and Dr. C. P. Thornton of the Pennsylvania State University for constructive criticism. They are, however, not responsible for the opinions expressed in this paper.