Comments and Communications

Terraced Canyons[1]

To a glacialist who has long been a student of Greenland the significance of the great canyons traced by Maurice Ewing and Donald Spurr on the floor of the Atlantic Ocean looms much larger than it does to the general reader. These canyons must have been excavated by rivers that flowed on land surfaces. Ocean rivers, such as the Gulf Stream of the Atlantic or the Japanese Current of the Pacific, do not cut canyons. These canyons were clearly cut by the meltwater from a Greenland glacier, which was several times larger than the present one. Quite a bit of this glacier must have been on land which then surrounded the Greenland of today and which was left unsubmerged because of the withdrawal of the water taken out of the seas to make the glaciers of the Pleistocene.

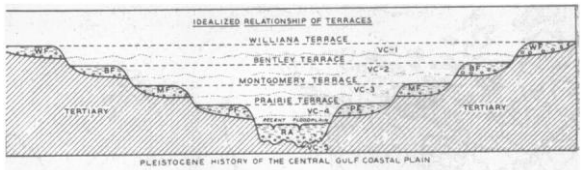
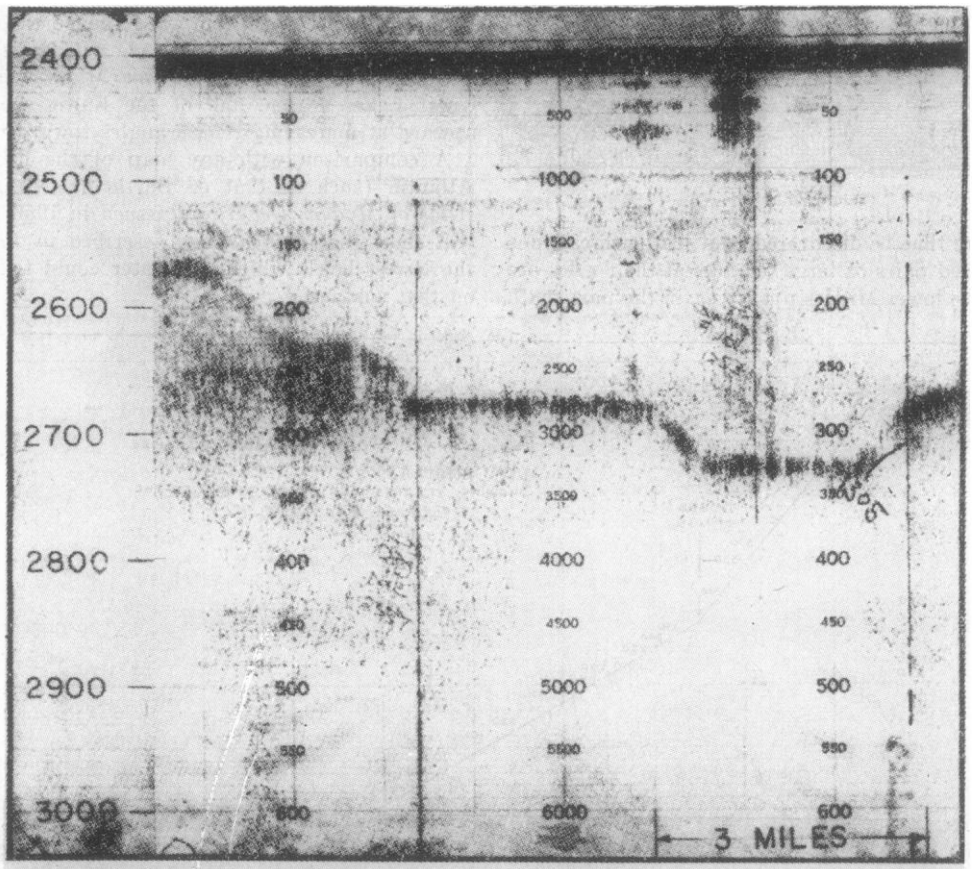


Fig. 21. The four ancestral channels of the Lower Mississippi River, each represented by a pair of terraces, beginning with the earliest, the Nebraskan, at the top (after Fisk).

FIG. 1.

As a student of Greenland I have long expected that these canyons on the floor of the Atlantic would at

[1] *Editorial Note*: This article by William Herbert Hobbs is published posthumously as a tribute to a man whose fertile mind remained active to the time of his death at 88, and whose agile body failed him only a few weeks before this communication was written on his deathbed and submitted on November 11. It was prompted by an article he had read in *Life*, in the issue of October 27. In covering letters he apologized for lack of documentation. SCIENCE hopes to pay further tribute to him in an early article by George D. Hubbard.



CANYON IS DETECTED on a depth chart made during one of the tug's passes over it. Chart begins at foothills of mid-Atlantic ridge where water is less than 2,600 fathoms deep (*left*). Tracings show how bottom leveled off at 2,700 fathoms (*center*), dropped abruptly when tug crossed canyon (*right*).

FIG. 2.

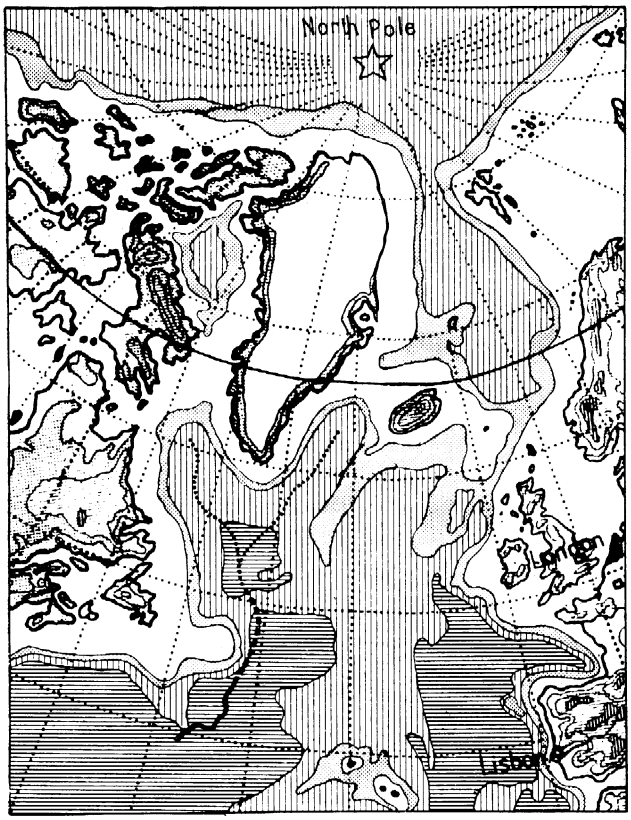


FIG. 3.

some future time be discovered, and just such canyons with matched pairs of large terraces at their sides are found in the lower Mississippi River, in the part south of Cairo known as the Mississippi Embayment (Fig. 1). In 1947 I described these great canyons on the basis of the magnificent monograph by Fisk in a government report. The original maps and sections by Fisk are not easily accessible, but they are reproduced in my recent book (*1*).

An article in *Life* (*2*) shows that the rivers so recently discovered on the floor of the Atlantic had terraces similar to those described by Fisk in the lower Mississippi. This is shown by a comparison of *Life*'s section on page 140 (Fig. 2) with Fig. 1. It can be confidently predicted that when Ewing's section has been extended westward, as it no doubt will be, the uppermost terrace will be found to be the broadest of all. In the lower Mississippi this corresponds to the earliest of the four glaciations, and the river channel of that time was 70 miles across. That on the floor of the Atlantic was formed by a glacier considerably smaller than that of North America and will be considerably narrower.

The terraces of the Mississippi River formed at the same time as those on the floor of the Atlantic will presumably tilt upward toward the north, so that a section made in a higher latitude will be at a higher level. The terraces of the lower Mississippi, of the Great Lakes region, and of the Baltic area all tilt upward at increasingly high angles toward the north.

A comparison with any map of the floor of the Atlantic (such as that of Bartholomew's *Advanced Atlas of Modern Geography* issued in 1950 [Fig. 3]) will show that the canyons described in *Life* follow the lowest levels which meltwater could take flowing on that surface.

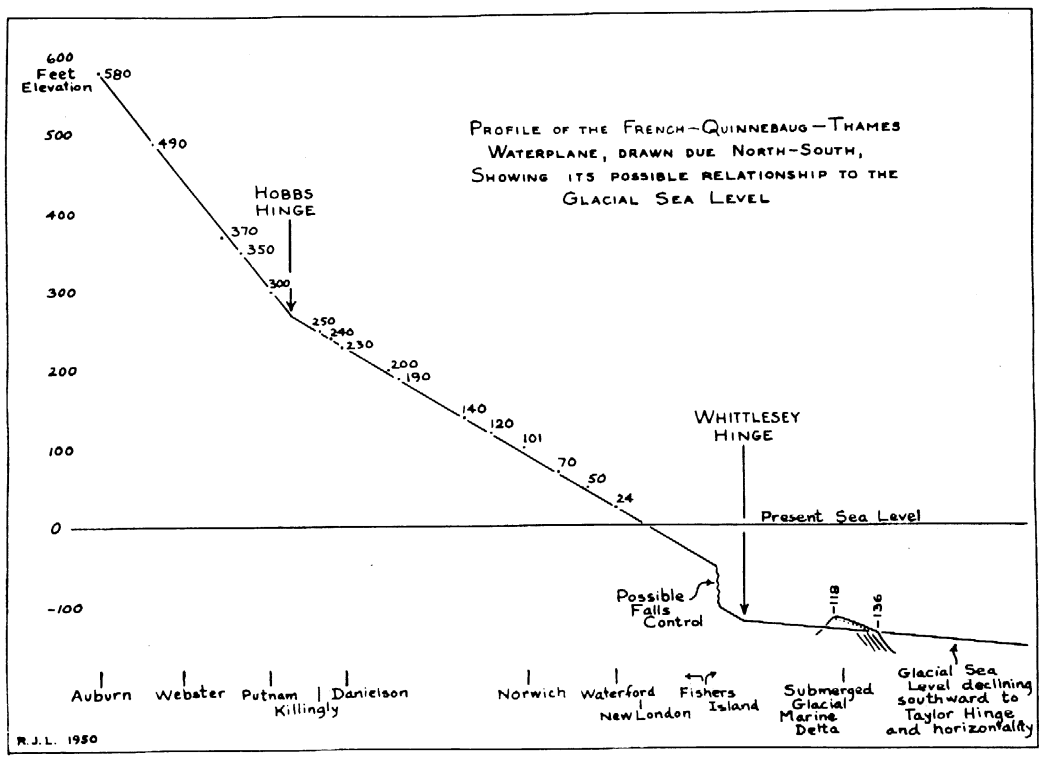


FIG. 4.

It can be confidently predicted also that, when the canyons have all been mapped, there will be found an almost innumerable series leaving the front of the Greenland glacier of that time and flowing into the two forks represented on *Life*'s map. Lougee and Vander Pyl have recently described a line of no vertical movement, which follows the axis of Long Island Sound and continues on the floor of the Atlantic (Fig. 4). South of this axis of neither upward nor downward movement the ocean floor has been sinking at a rapidly increasing rate southward. This has been the main cause of the land bridge which, at the end of the glacial period, joined Europe to America and on which the meltwater of the Greenland glacier took its course and cut the canyons.

WILLIAM HERBERT HOBBS

References

1. HOBBS, W. H. *Glacial Studies of the Pleistocene of North America.* Part II. *The Glacial History of Iowa and Neighboring Portions of Missouri.* Ann Arbor, Mich.: J. W. Edwards, 41–109, Fig. 21 (1947).
2. *Life,* **33,** (17), 139 (1952).

Book Reviews

Atomic Energy Levels as Derived from the Analyses of Optical Spectra, 24Cr–41Nb, Vol. II. Circ. 467, National Bureau of Standards. Charlotte E. Moore. Washington, D. C.: GPO, 1952. 227 pp. $2.25.

Two years have elapsed since the publication of the first volume of this valuable standard work on atomic energy levels. This is an astonishingly short interval if one considers the enormous amount of work connected with a critical compilation of this kind. Everyone familiar with this type of work is filled with admiration for the author who has carried on this important task with such high efficiency.

This second volume contains the spectroscopic data of the elements chromium to niobium and gives the energy levels of 152 spectra. The arrangement of the tables is the same as in the first volume. The elements are treated in order of increasing atomic number and, for a given element, the spectra follow in the order of increasing ionization stage (Lockyer's symbols). The tables of an element in a given ionization stage are preceded by data concerning ground state configuration, term value of the ground state, ionization potential, explanatory notes, and references. The tables proper contain the data of each level, namely, electron configuration, abbreviated level designation, J-values, level with respect to the ground state in cm^{-1}, and, if known, Lande's g-value. As far as suitable, each level table is followed by an array containing all observed levels and the reference to tables of predicted levels given in Volumes I and II. Two pages of valuable revisions concerning spectra treated in the first volume conclude the impressive work.

K. W. MEISSNER

Department of Physics, Purdue University

Rheumatic Diseases: Diagnosis and Treatment. Eugene F. Traut. St. Louis: Mosby, 1952. 942 pp. Illus. $20.00.

A growing interest in the rheumatic diseases is reflected by an increasing number of publications on this subject. A general division of Dr. Traut's text is indicated by the subtitle: "Diagnosis and Treatment." The former constitutes about two thirds and the latter about one third of the book, but there are repetition and overlapping of these subjects in various chapters. Special subjects relating to rheumatic disease are discussed in six chapters contributed separately by other authors.

Uniformity of opinion about rheumatic diseases is perhaps not to be anticipated in the current era of changing concepts. Dr. Traut, in a number of generalized discussions, seems to favor a unitarian concept of rheumatic diseases.

The author discusses his therapeutic experiences in clinical practice and compiles numerous reports from the medical literature. He notes that standardized treatment does not exist and that "improvement obtained by 'psychology' or suggestion need not be condemned." In his opinion, enthusiasm for gold therapy in arthritis is waning. He also has "tried not to display unjustified enthusiasm . . . [for] the exciting new endocrinologic therapy of rheumatic disease." Hence there is limited consideration of this timely aspect of the study and treatment of certain rheumatic diseases.

Dr. Traut regards a stock vaccine "as an indispensable part of my armamentarian" in the therapy of rheumatoid arthritis. He also uses a vaccine for patients convalescing from rheumatic fever, as it has seemed to him that such patients "had decidedly fewer recurrences than those not receiving vaccine."

References are conveniently indicated at the bottom of the pages in most of the chapters. There are charts on differential aspects of some types of articular disease or joints affected. The text is very readable and is free of typographical irregularities. The author has undertaken a comprehensive task in the compilation of a text intended to be "understandable to the medical student, of practical use to the internist and the physician in general practice, and valuable as a reference and source book to the rheumatologist."

HOWARD F. POLLEY

Department of Rheumatology, Mayo Clinic