THE twenty-fourth annual Exhibition of Scientific Instruments and Apparatus under the auspices of the British Physical Society will be held at the Imperial College of Science and Technology from January 9 to 11, 1934. Evening discourses will be delivered during the exhibition by Mr. R. S. Whipple, on "The Evolution of the Galvanometer," Mr. J. Guild on "The Instrumental Side of Colorimetry" and Sir Ambrose Fleming on "The History and Development of the Thermionic Valve."

THE Committee on Scientific Research of the American Medical Association invites applications for grants in aid of research on problems bearing on the clinical aspects of medicine and surgery. Inquiries may be addressed to the committee at 535 North Dearborn Street, Chicago.

MISS M. D. RANKIN, Greenock, has given £20,000 to the University of Glasgow to provide a fund for medical research. The donor has expressed a wish that the claims of cancer research should receive special consideration, but apart from that the fund is to be available for any kind of medical research into the origin and curative treatment of disease. An executive committee of six members will be set up to administer the fund. A bequest of £8,000 has also been made to the university by the late Miss B. Aitken Gray for the endowment of a traveling bursary in engineering. With this fund a bursary will be instituted. It will be awarded by competition, and the successful student will be enabled to travel to study engineering achievements in different parts of the world.

A CORRESPONDENT to the London *Times* reports that the expedition to Abyssinia under the leadership of Mr. Wilfrid Thesiger has reached Addis Ababa. Mr. Thesiger is the son of the Honorable Wilfrid Thesiger, who was for ten years British Minister to Abyssinia. The expedition is supported by the Royal Geographical Society, the Percy Sladen Trust and Magdalen College, Oxford. The object of the expedition is to explore the still little-known Danakil country, which lies between the Abyssinian table-land and the Red Sea. The Hawash River, which rises in the mountains near Lake Zwai, flows down into the Danakil plains, and there is lost in the Aussa Sultanate. Its lower course has never been followed; its banks are covered with thick bush and the valley is extremely malarious. The region is inhabited by the nomadic, camel-owning Danakils, a warlike tribe akin to the Somalis, given to raids on the Abyssinians in the hills. The party will first undertake a short journey south of Addis Ababa to the headwaters of the Hawash River, to try out the caravan, and will then endeavor to follow the river to its end. They will make a compass traverse of the route and collect all possible specimens of mammals, birds and plants. Work will also be carried on for the Locust Investigation Bureau. The caravans will then be reequipped for a long journey north of the Simien Mountains, where the party will remain for about a month making further collections and endeavoring to get specimens of the Abyssinian ibex. This animal is only to be found in these precipitous mountains, which rise in places to a height of some 15,000 feet. The expedition will be away about nine months, and hopes to bring back a comprehensive collection of the varied Abyssinian fauna and flora.

ACCORDING to the *British Medical Journal*, the annual report of the council of the Royal Society of Medicine, presented to the recent annual general meeting of fellows, states that the roll of the society now includes 4,967 names, the great majority being those of fellows. The number of meetings of the society held last session was 166, comparing with 183 the year before. The number of readers in the library during the year was 44,391, and the number of books borrowed for home use was 28,679. The income of the society for the session was £22,473, an increase of £144 on the previous year, and it is explained that this relatively small increase in income is due to the fact that the financial crisis caused many more resignations than usual, though, fortunately, the accessions to the society outnumbered the resignations and deaths. The total expenditure was £506 less. At the request of the India Office the council of the society has considered the report of the Indian Drugs Inquiry Committee, and the Section of Therapeutics and Pharmacology has prepared a memorandum on the subject, which has been forwarded, through the India Office, to the Government of India.

DISCUSSION

GEOLOGICAL MISCONCEPTIONS CONCERNING THE OCEANS

CERTAINLY no phase of geology has been so neglected as the study of the ocean floor. Because of this neglect and because of scarcity of information up to recent times various ideas with very little basis in fact have taken form and become fixed in the writings and teachings of geologists. For example, one obtains the impression from typical text-books that the continental shelves are graded platforms which extend out from the shore to depths of approximately 100 fathoms (600 feet) where they are terminated by a steep slope, because this depth represents "wave base." The shelves are said to consist of wave-cut terraces inside and wave-built terraces beyond. The sediments on the shelves are supposed to be arranged

according to texture with gravel inside, sand beyond, and silt and clay covering the outer portions. Coastlines are classified as submerged if they have estuary inlets and emerged if they have elevated terraces. The presence of submarine valleys cut deep into the ocean floor beyond a coast is referred to as evidence that the coast has submerged recently. The deep ocean floor is described as being a monotonously flat plain over most of its vast area. Ten years of study of the geology of the oceans have convinced the writer that all the above statements are subject to grave doubt and that some of them are clearly erroneous.

Continental shelf profiles: Theoretically a smooth outward slope, somewhat concave inside and convex outside, is the profile of equilibrium which the waves would establish if they were allowed to operate undisturbed over a long period. Soundings of the shelves from all parts of the world show that such graded profiles are extremely unusual. The typical profiles show many irregularities, such as hills and depressions, and where soundings are closely spaced it becomes evident that there are a series of terraces separated by moderate slopes. These features are surely antecedent in origin to present conditions. In general, profiles show the broadest flat and gently sloping areas inside the 50 fathom contour, but the real steepening of the slope which represents the outer terminus of the shelf and the beginning of the continental slope does not come in most cases till depths of from 60 to 80 fathoms are obtained. It is unusual for the shelf margins to extend to depths of 100 fathoms. On the other hand, off glaciated coast wide areas, mostly on the inner and intermediate portions of the continental shelves, exceed 100 fathoms.

Wave-built terraces: Almost all geology text-books have a diagram of a wave-built terrace beyond a wave-cut terrace (Fig. 1a). Emerged wave-cut terraces are found along practically all coasts of the world,

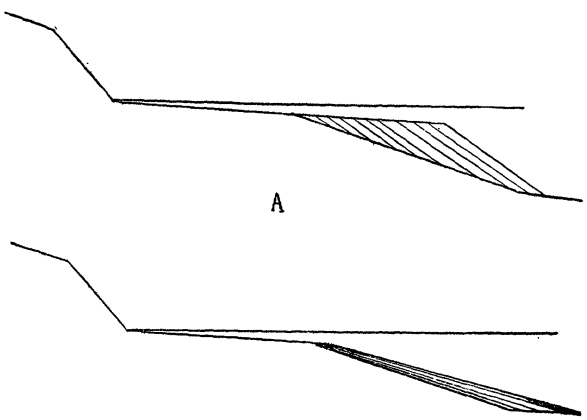

FIG. 1.

but so far as the writer has discovered from a perusal of the literature and from consultation of well-known students of coastal phenomena there are no clear examples of wave-built terraces with the relations which are depicted in the text-book diagrams. While this lack may be due to the removal of the wave-built portions during or subsequent to emergence, it seems at least as likely that the seaward moving products of wave erosion are distributed as fans at the terminus of the wave-cut terraces (Fig. 1b).

It seems improbable that the outer portions of the continental shelves are wave-built terraces on still other evidence. Most of the continental slopes are too steep and too irregular to represent the outbuilding of large masses of fine sediment from the land. The profound steep-walled submarine canyons which are cut into most of these slopes must certainly have rock walls, and various samples have indicated that this is actually the case. On the other hand, the gentle continental slopes off some large deltas, notably the Mississippi, may be sedimentary in origin, most likely representing the foreset slopes of deltas built during the low sea-level stages of the glacial period.

Continental shelf sediments: According to all available evidence, the simple gradation outward of coarse into fine sediment across the continental shelves is as rare as is the occurrence of graded topographic profiles.[1] Muddy sediments on the outer shelf are rather unusual, even off large rivers. The finest sediments are found in bays near shore, while the typical arrangement of sediment on the open shelves is patchy, with almost haphazard mixtures of mud, sand and gravel all the way to the outer margin.

Coasts of submergence and emergence: It is probably little or no exaggeration to say that an examination of the land in the vicinity of every indented coast cited as typical of submergence would reveal evidence of emergence and that examination of the sea floor adjacent to every coast with elevated terraces would reveal evidence of submergence. This statement is only surprising if one fails to appreciate the well-established changes in sea-level which must have accompanied both the forming and melting of the great continental glaciers of the ice age. Because of the vast ice sheets of Antarctica and Greenland which still exist the present is a time of intermediate sea-level. The last important change was the rise in the ocean which must have accompanied the melting of the last great ice sheets some 10,000 to 25,000 years ago. Since this rise was a world-wide phenomenon, most coasts should show evidence of a relative submergence. Exceptions might be found where shore processes had straightened the coasts or where

[1] F. P. Shepard, "Sediments of the Continental Shelves," *Bull. Geol. Soc. America*, 43: 1017–1040, 1932.

there had been more recent upheavals. Conversely, terraces up to about 200 feet above sea-level may have been cut by waves during interglacial epochs, due to a rise in sea-level accompanying melting of the Antarctic ice sheets.[2] Accordingly, it seems probable that most coasts which have been relatively free from Quaternary diastrophism should possess these common characteristics of both submergence and emergence.

Deep inlets along glaciated coasts: Fiords along mountainous coasts have been considered by most physiographers to be the product of glacial erosion,[3] but the deep inlets along hilly glaciated coasts are generally referred to as drowned valleys. Since these estuaries have depths in excess of any submergence which can be properly applied to post-glacial rise in sea-level, they might be evidence of real sinking of the land. There are, however, several reasons for doubting such evidence. These deep inlets are almost entirely lacking, except along glaciated coasts; their submerged portions are closely related in character to typical glacial fiords; and the adjacent coasts have strong evidence of post-glacial uplift of large amounts.

Submarine valleys and high terraces: Still greater confusion in the classification of coasts as submerged or elevated comes from the study of what appear to be wave-cut terraces hundreds of feet above sea-level and of submarine valleys thousands of feet deep.[4] Finding either the one or the other would be supposed to show definitely whether the coast had emerged or submerged. The difficulty lies in the discovery of both phenomena along many coasts. Geologists have claimed that there are high terraces along practically all coasts, and the charts show evidence of submarine valleys thousands of feet deep off most of the coasts of the world. If the high terraces were actually cut by the waves and if the deep submarine valleys were cut by rivers, it must mean that coasts have been very unstable and have been subject to great uplifts and depressions.[5] Before concluding that a coast has emerged or submerged on the basis of these two phenomena one should be sure either that only one or the other is to be found or that one process clearly anteceded the other and that evidence for the wave-cut terraces or the river-cut valleys is substantial.

Deep ocean floors: It is only in recent years that profiles have been made across the oceans with sufficient soundings to make it possible to judge the character of the ocean floor. The numerous transoceanic profiles made by the United States Navy and Coast Survey and by the German ship *Meteor,* all made by echo soundings, show that plains on the ocean floor are unusual and that irregular topography is much more common. The minor irregularities comparable to small erosional features on land may not exist, except on the continental slopes, but it seems probable that there are more major irregularities and less monotonously flat areas than on the continents.

FRANCIS P. SHEPARD

[2] C. W. Cooke, "Correlation of Coastal Terraces," *Jour. Geol.,* 38: 577–589, 1930. The tracing of terraces along the coasts at approximately the same level is questioned by some geologists.

[3] For a refutation of the proposed fault origin of fiords see D. W. Johnson, SCIENCE, n. s., 41: 537–543, 1915.

[4] Some writers have questioned whether the deep submarine valleys, like that off the Hudson, were cut by rivers, but recent surveys have shown that many of these features have river valley characteristics. See "Submarine Valleys" (*Geog. Review,* 22: 77–89, 1933) for a discussion of the various hypotheses.

[5] The large vertical range appears to exclude the possibility of these changes being due to fluctuations of sea-level during glaciation and deglaciation. The uniform levels of the continental shelves suggest that there has been a long period of stability since any great uplifts and sinkings such as may account for high terraces and deep submarine valleys.

FALSE REMEDIES FOR CARBON MONOXIDE ASPHYXIA

MANY investigators now misconceive the physiology of carbon monoxide asphyxia. Because of these misconceptions they suggest drugs that they believe should be cures or at least helpful. The drugs suggested fall into one or both of two classes: (1) Those that might assist the respiratory ferment of the tissues, and (2) drugs stimulating respiration.

The affinity of the respiratory ferment for carbon monoxide was found by Warburg to be very much weaker than that of hemoglobin. Even in an atmosphere of carbon monoxide deadly for man, only a negligible amount of combination with the respiratory ferment occurs. Substances like methylene blue can aid the respiratory ferment only in isolated tissues. When introduced into the living body they convert hemoglobin into methemoglobin, and render an additional fraction of the blood inactive for oxygen transportation. Such substances are synergists, not antidotes, of carbon monoxide.[1]

The drugs of the second type that have been exploited in recent years are chiefly alpha lobeline and methylene blue. They are respiratory stimulants: a class of drugs that is so large that out of it numerous additional investigators could each suggest his own "cure for carbon monoxide asphyxia." Of course an animal or man asphyxiated to the point of failing respiration shows an immediate apparently beneficial effect from such a drug. Respiration is temporarily augmented. The proper object in such cases is, however, not a pharmacological demonstration, but a

[1] H. W. Haggard and L. A. Greenberg, "Methylene Blue: A Synergist, not an Antidote, for Carbon Monoxide," *Journal of American Medical Association,* 100: 2001–2003, 1933.