Sir John Franklin's expedition will be included. A grant of $200,000 has been contributed toward the building by the Pilgrim Trust Fund, founded by Mr. Edward S. Harkness.

THE Munich correspondent of *The New York Times* reports that another German expedition is being made to the Himalaya this summer. The party, which will be nine or ten in number, consists for the most part of first-class Bavarian mountaineers and members of the Munich Alpenverein, but two or three members of the American Mountaineering Club are on their way from the United States to take part in the expedition. The expedition will attempt the ascent of Nanga Parbat, 26,629 feet, in the Kashmir Himalaya. If successful, the climbers will have reached a summit higher than any yet attained by man, though not the highest point reached—a record held by Mallory and Irvine on Mount Everest. Only one previous attempt has been made to scale Nanga Parbat; this was in 1895, when the British mountaineer, A. F. Mummery, lost his life in the venture. The leader of the German expedition is Herr Wilhelm Merkl, a Munich engineer, who, in 1929, took part in an expedition across the Caucasus which included an ascent (the third on record) of the extremely difficult Uschba Mountain. The expedition will leave Munich on April 26 and will depart from Srinagar, the capital of Kashmir, *en route* for the mountain, early in June.

DISCUSSION

THE ANALYSIS OF ELECTROMYOGRAMS

THE method described by Travis and Hunter[1] in a recent issue of SCIENCE for the study of the human electromyogram calls for comment, since it seems to be almost expressly designed to obscure well-established physiological facts concerning the activity of the central nervous system. Their method consists essentially of determining what percentage of the "output voltage" will pass various electrical filters designed to eliminate alternating current components above a given frequency. The authors offer the method as a means of "reading" the irregular electrical disturbances generated during muscular contraction. The implication is inescapable that they anticipate analyzing the "action current wave" into its components and interpreting variations which may be found under various conditions. They neglect, however, to evaluate their method in the light of the known facts of muscular physiology. The action currents of muscles in voluntary contraction present an irregular and confused picture due to the combined asynchronous activity of many individual units. Each active unit generates a series of electrical pulses or action currents at a rather slow and more or less regular rhythm. The way to clear interpretation does not lie in an analysis of the resulting total disturbance in terms of frequencies as revealed by electrical filters, since this method implicitly assumes that the whole is composed of a variety of alternating current components of various frequencies. The total action current can be described in this way, but the result has little connection with the underlying phenomena, and therefore can only be misleading.

Adrian and Bronk[2] have shown that by means of a hypodermic needle, which contains within it a fine insulated wire, effective contact can be made with a relatively small number of active muscular units. We have repeated their observations and confirmed the fact that the rhythms of individual units appear clearly in the record of contractions of moderate intensity. This method offers a direct analysis of the situation, and demonstrates immediately that the number of impulses per second in each motor unit in voluntary contractions is of the order of ten to fifty or a hundred. The method of Travis and Hunter completely misses this fundamental fact, only 10 per cent. of the total action current being ascribed by them to frequencies below one hundred.

The peak of frequencies represented, according to Travis and Hunter, lies at about 400 per second. This result almost certainly depends upon the time-relations of the individual action currents in the muscle fibers. These rise from zero to their maximum voltage in approximately a thousandth of a second and fall again somewhat more slowly. Waves of these time-relations, whether recurring regularly or irregularly, when confronted by a series of graded electrical filters will not be greatly reduced by those which pass frequencies up to 1,000 per second but will be considerably reduced by those whose limit is 400 and very much so by 200. In other words, these waves will have a large component between 300 and 500 when analyzed by filters, whether the waves occur singly, or at regular intervals or at random. Travis and Hunter's frequency curve therefore depends primarily upon the shape of the individual impulses and not upon the fequency of their occurrence. It is the latter which varies with different degrees of activity of the neuro-muscular system while the former is relatively constant and depends upon the local condition of the muscle itself. If it is desired to study frequency it is now quite easy to obtain a record of a series of indi-

[1] L. E. Travis and T. A. Hunter, SCIENCE, February 19, 1932.

[2] E. D. Adrian and D. W. Bronk, *J. Physiol.*, Vol. lxvii, No. 2, p. 119, 1929.

vidual impulses which one may "read" quite easily, and, if desired, a Fourier analysis may be applied to the oscillograms of the individual impulses.

Why endeavor to infer the properties of an individual egg from an omelette, even by means of elaborate chemical analysis, when the individual eggs can be purchased separately?

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THE PINE FORESTS OF COSTA RICA

IT was not through oversight that in his "Plantas Usuales de Costa Rica" Professor H. Pittier failed to mention the occurrence in that country of pine trees. No one knows the vegetation of Costa Rica so well as the writer of that now almost classic report, and if trees so important economically as pines did occur in Costa Rica, he could not be pardoned for neglecting them.

But, in a recent volume devoted to the "Tropical Forests of the Caribbean" (Gill, 1931), the reader is informed that "In British Honduras pine extends practically to the coast, but in Costa Rica it is confined to the uplands, and in Panama fades out entirely" (whatever the last phrase may mean). Opposite the page (p. 151) on which this statement appears, there is a map illustrating the distribution of pine forest in Central America. There is a modest strip of black extending the length of what apparently is intended as the main cordillera of Costa Rica (which does not exist), with a discreetly reduced, isolated patch of black farther south, near the Panama border.

Further, on page 317, under Table No. 3, it is stated that the forest area of Costa Rica consists of eight millions of acres, of which one million acres are reported optimistically as "conifers." Under "remarks" there appears the distressing information, "Pine type badly injured by fire."

The present writer is not prepared to criticize the forest data reported for other countries, although to one who has traveled by railroad from Puerto Barrios, Guatemala, to Guatemala City it is evident that the distribution of pine forest as indicated for that country is erroneous. Likewise, a botanist who has studied the flora of the Pacific coast of Central America will be unable to comprehend why Pacific Nicaragua should be mapped as "deciduous" forest, and all the rest of the Central American coast as "rain" forest. The facts are that exactly the same species of trees characterize the Pacific flora all the way from Guatemala at least as far as the Nicoya Peninsula in Costa Rica, and to Panama, for that matter. Floristic areas, unfortunately, do not usually coincide with political boundaries; it would make work easier for the systematic botanist if they did.

The subject of the southern limit of pine trees (and of all conifers) in North America is a matter of substantial scientific and economic interest, else it would not deserve mention here. In a book which purports to be scientific, the information published should be as accurate as possible, or else omitted. The distribution of pines in tropical America has been discussed by competent writers, and the facts could have been obtained without any great amount of research. Thomas Belt, in "A Naturalist in Nicaragua," reports that when traveling northward from Chontales, he observed the first pines in the vicinity of Matagalpa, and that is probably their southernmost extension in North America. (They do not occur, of course, in South America.)

The quotation cited in the second paragraph of this article should be corrected to read: "In Costa Rica pines are confined to dooryards," and in the table mentioned the area should be reduced from one million acres to one acre. A plot of that size, perhaps with a little crowding, would contain almost all the pine trees of Costa Rica. They do exist, it is true, for in two winters passed in the "uplands" I have seen some of them, but they were always about houses, and evidently planted. Systematic questioning of country people and of educated persons thoroughly familiar with the country failed to elicit a single report of the existence in Costa Rica of a native pine tree. In a recent letter to the present writer, Mr. F. Charles Clark, a lumber exporter of San José, Costa Rica, writes: "I have traveled practically all over the forests of this country, I might say, looking for native pine (genus *Pinus*), without success. I can not imagine anyone making a statement that there are millions of acres of pine trees in this country, and I, for one, should like to come across the first native tree." Friends of forest conservation may be comforted by the fact that under the circumstances it is scarcely possible that the Costa Rican pines have been "badly injured by fire."

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THE SOARING OF TURKEY BUZZARDS

THOUGH the means by which certain birds accomplish their soaring flight with wings held stationary is by no means the mystery it was before man learned to make use of upward air currents in flight with motorless gliders, the following observation seems of interest. The observation may not be unusual, yet neither myself nor any of the half dozen others who witnessed it had previously noticed it.