Board of Surveys and Maps. Mr. Wallace succeeds Alfred D. Flinn, secretary of Engineering Foundation, and has been assigned to the Committee on Cooperation. Members of the Advisory Council of the board have been urging the American Engineering Council to aid them in obtaining an adequate program involving a larger appropriation for topographic maps. Congress has asked for an outline of this program and as soon as this is completed the council will decide on the support that can be given.

THE prospect of large lumber operations in South America carried on by interests from the United States is opening a field of promising possibilities to the American forester, and this situation has caused the faculty of the New York State College of Forestry to consider the advisability of adding Spanish to the language requirements of the forestry course. The value of Spanish to the American forester is a reflection of the growing scarcity of forests in the United States and Canada. The consequential high prices of wood products make lumbering in distant countries profitable. South America, according to authorities of the college, presents a new sphere of discovery in wood utilization as there are many species of trees about which little is known regarding their applicability to commercial purposes. The pine forests of Chili and southern Brazil occupy vast areas. The Brazilian Parana pines are said to cover 260 million acres and will produce from five to ten thousand board feet per acre. Restrictive export duties and the lack of shipping facilities have prevented earlier exploitation of these natural resources of South America, but the prodigality of the United States in the use of its forests has overcome these obstacles.

UNIVERSITY AND EDUCATIONAL NOTES

THE College of Agriculture and the College of Veterinary Medicine of Cornell University will receive approximately $1,350,000 from the State as a consequence of the appropriation bill signed by Governor Miller. The College of Agriculture will receive, roughly, $1,250,000, while the Veterinary College, it is estimated, will receive $100,000, which is slightly less than last year's appropriation.

THE North Carolina Legislature has granted the University of North Carolina $925,000 as a two-year maintenance fund and $1,490,000 for permanent improvements for two years.

PROFESSOR GEORGE C. EMBODY has returned to Cornell after spending the period since last September establishing at the University of Washington the first college of fisheries in an American university.

DR. IRA M. HAWLEY, of Cornell University, has been appointed professor of zoology and entomology at the Utah Agricultural College and Entomologist for the Utah Agricultural Experiment Station. Sherwin Maeser, Ph.D., University of California, has been appointed associate professor of chemistry at the college.

DR. LEWIS KNUDSON, of the department of botany of Cornell University, has gone to Spain to assist in establishing departments of plant physiology in the Universities of Madrid and Barcelona.

DISCUSSION AND CORRESPONDENCE

PALEOBOTANY AS VIEWED BY TWO GEOLOGISTS

IN the current April *American Journal of Science* appear two papers reciting the larger stratigraphic and faunal evidence bearing on climate in time. Professor A. C. Coleman in the first of these lectures cites especially Dr. Knowlton's views of all-tropic ancient climates thus:

> Part I. of Dr. Knowlton's paper rouses enthusiasm with its splendid array of forests mostly tropical from all parts of the world culminating in the Eocene flora. His account of the vegetation of the past confirms and heightens the impression left by paleozoology that during the greater part of the world's history temperatures have been genial even in the far north and far south where

frigid climates now reign. Annual rings are rarely found in the trees, and only once before the Pleistocene is a period of severe cold admitted in the early Permian time of glaciation; and then the cold period was "probably of short duration," and did not affect North America, Europe or northern Asia.

It is further observed that while few references to periods of cold or drought in the world's history are found in paleobotany, "mild and moist periods are tremendously emphasized," and intervening periods of drought and cold "slurred over, or entirely unrecorded."

It is not surprising, then, that the evidence for aridity and cold during several periods of the earth's history should make little impression on a paleobotanist!

In somewhat similar inference or vein, Professor Charles Schuchert follows with several pages on climatic evolution. To Coleman's brief consideration of the more readable phases in the evidence for desert conditions seasonal variations, and ice ages in the past, Schuchert adds the Blackwelder view that a study of the color phases and stratification of the Alaskan sedimentary series indicates a more or less persistently cool moist climate throughout the known geologic history of Alaska. And the more or less provable fact is emphasized that there is usually "a dearth of plant evidence for the climatic conditions during the early and late parts of the many periods when the continents were largest, highest and most arid."

For several years I have called attention to the remarkable series of Rhätic plant localities in Argentina which strongly suggest a climate like that of to-day. And too, the shales in which these plants occur are highly laminated [seasonally so]. But in such instances, which may be depended upon to multiply, the paleobotanist must yet find the fuller means of proving the presumption of cold and aridity from plant types, however insistently others may ask immediately coordinated proof. Similarly it was stated in SCIENCE several years ago that:

> There is a very small record of the upland vegetation of past times; although the enormous extent of the unknown upland record could not be surmised so long as the alternate emergence and subsidence of the continental areas remained wholly unmapped. Yet it appears that the high upland and polar, and not the tropic or coastal fringe plants have long included the great majority of plastic forms; and it is certain that upland and polar forms moved forward during the periods of continental emergence closing the geologic epochs, and were least liable to extinction during medial subsidence. That is to say we know best the aplastic coastal fringe forms with a broken record.

Again it was stated (Vol. II., p. 238, American Fossil Cycads):

> Almost invariably from the Devonian on, it has been mainly xerophyllous lacustrine or swamp types which form the great bulk of fossil plants. Even the 3,000 species of Carboniferous time afford only a one-sided picture of the specialized coal swamp floras; no glimpse is had of contemporary mountain or upland florules.

Furthermore the notion that the tepid climates of the older botanists and zoologists have no basis (Berry), and are not sustained by the long studied invertebrate record, only finds a more insistent expression in recent text books. It goes back to Leopold von Buch, and received elaboration by Neumayr. It finds so far as elements go mention in Dana. It was stated to me in pretty hard and fast form in the field as a beginning student, by an old teacher, A. von Könen, twenty-eight years ago. And any one who takes the trouble to read a contribution I brought out in 1903, on the rôle of polar climates in evolution, then a sort of philosophic study, can well understand that the ideas of the real character of sediments and the indicators of seasonal change which are quite in entirety of more recent date, would have been "old grist" for the polar mill.

As a main objective, let me try to explain in a few brief paragraphs for the sake of both botanists and geologists the nature of the paleobotanic crux.

Primarily the Cretaceous floras looked tropical, and it has been difficult to read anything else into them. If it can be done it will require long and elaborate quantitative study of the phytologic factors. It would however be early to say there are no cold scrub forests in the lower Cretaceous, and I give some attention to this subject in the current April number of the *American Journal of Botany*. Then at the other end of a long record stood juxtaposed the dank coastal fringes of coal plants; whence the long series of the Permian, Triassic and Jurassic, found their more obvious antecedents in warm climates and seemed to terminate in such. The ginkgos were long almost the only element suggesting interruption to the all-tropic landscape, with the fact that they must be a very great phylum, hidden. But with the cycads dominant and certainly tropical, there was no *open sesame* to a broader vista for the paleobotanist.

Now it was at this point that Nathorst and Wieland, using the words of the excellent University of Glasgow historian of botany, "began to learn something about the cycads." It was found that these had flowers with the possibility of all the sex variation seen in dicotyls, and stems with generalized structure. A great Cycadophyte leaf series was discerned resting under more than a suspicion of affinity to the forerunners of the angiosperms. And presently it was found that the cycadeoid types were in great numbers microphyllous, and that they crossed over into small fern-like leaves called *Tæniopteris*, etc. Next the paleobotanists seemed as if by common consent to see side by side with the ever lengthening cycadeoid record a great ginkgoid phylum. Within but a few fortunate years of investigation types of scrub, for such many of the cycadeoids surely are, and forest elements with the capacity to live in varied climates, could be pointed out with some degree of safety.

But as a bare half dozen invertebrates can not firmly set the age of the "Cannonball shales," limited series of animals and of plants of unfixed affinity, can make neither a summer nor a winter. And so the difficulties which beset the work on fossil plants must be met serially.

Meanwhile as paleobotanists we are peculiarly indebted to Dr. Knowlton for his splendid Philippic on tropic climates. It was well that it should appear in this time of rapid accumulation of new facts, at least as a warning against the grave danger of an overburden of inference in the guise of proven fact. Even that big and valuable word *diastrophism* might suffer. And the aggrading of the continents, with their reappearance, mountain bulwarked as regularly as Chladni figures, might fail of demonstration. The Knowlton defense has already functioned in bringing out the two accentuations of the value of the physical and paleozoologic factors herein noted. Yet, the lower-most Cretaceous floras of the mid-west are not truly tropic. We may doubt if there is a single North American dicotyledonous flora, unless it be that associated with the Vicksburg Oligocene, that by any possibility merits the term tropical in a strict sense. "Many of the floras indicate warmer or wetter conditions than now prevail in correspondent latitudes; but most are far from tropical."

All evidence must eventually be coordinated, and the paleobotanists will lay ears to the rocks. To use exactly the witticism of Voltaire, let our *conchiferous* brethren be reassured.

G. R. WIELAND

HAVE BIRDS AN ACUTE SENSE OF SOUND LOCATION?

THERE can be little doubt that the drum membrane picks up very minute energies in the form of sound vibrations. There can be no question that a certain amount of the energy impinging on the outer surface of the drum membrane passes through it into the air of a cavum tympani. It may also be conceded that energies entering the middle ear area are fairly well dampened out in so far as a reflection back toward the drum membrane is concerned. This is true for the mammals. The bird, however, has but a single middle ear