pillars; and *Cordyceps,* parasitic especially on various subterranean insect-larvæ. Attention was called to the economic importance of these fungi, and to the possibility of the use of *Empusa Anlicœ,* parasitic on the caterpillars of the brown-tail moth, in fighting the moth-pest. The paper was illustrated by specimens of the various fungi described.

At the 91st meeting, held on November 5, Dr. Caroline B. Thompson reviewed the recent work of McClung, Montgomery, Wilson, Stevens and others, on the chromosomes of insects, and especially Wilson's theory of the heterochromosomes as sex determinants.

MARY T. HOLLISTER,
Secretary

THE ELISHA MITCHELL SCIENTIFIC SOCIETY OF THE UNIVERSITY OF NORTH CAROLINA

THE 173d meeting was held in the main lecture hall of the Chemical Laboratory, Tuesday evening, November 12, 1907, at 7:30 o'clock. Dr. W. C. Coker described "A Trip to Porto Rico." The talk was fully illustrated with lantern slides and a large collection of botanical specimens.

A. S. WHEELER,
Recording Secretary

DISCUSSION AND CORRESPONDENCE

LODGE'S ETHER AND HUYGHENS'S GRAVITATION

THE alarming density of the ether which Sir Oliver Lodge believes must be taken into consideration is liable to leave one more open-mouthed with astonishment than did Lord Kelvin's famous molasses-candy ether, even if open mouths are suggested in connection with the latter. But 10^{12} grams per cubic centimeter is not an every-day experience, consciously at least. I have thought of it in relation to Huyghens's ingenious mechanism for gravitation. If a body rotates in a fluid *lighter* than itself, it must in virtue of centrifugal force and Archimedes's principle, *sink* toward the center of rotation. Electronists insist that the ether is absolutely stationary: but suppose that it rotated just a little with the earth. We may then write for the buoyancy per cubic centimeter $\rho_e\omega_e^2R$ and for the centrifugal force per cubic centimeter of submerged matter $\rho_m\omega_m^2R$, where ρ, ω, R denote density, angular velocity and radius of curvature, respectively. In other words

$$\omega_e^2/\omega_m^2 = \rho_m/\rho_e = 10^{-12};$$

that is, if the angular velocity of the ether were but one millionth that of the earth about the sun, there would be no centrifugal force to compensate gravitation. The brilliant experiments of our recent medallists show that observationally, $\omega_e = \omega_m$. The electronist gets around this by the principle of relativity. But if, granting Lodge's ether as little as $\omega_m/10^6$ would imply conditions comparable with gravitation, one can not escape a little uneasiness unless, from the interpenetration of matter and ether, ρ_m is ultimately, *i. e.,* per corpuscle, much larger than ρ_e. As a whole, however, a fixed ether would be the only satisfactory inference.

CARL BARUS

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METAGENESIS IN INSECTS

IN a recently issued paper by Professor Montgomery[1] attention is called again to the condition approaching an alternation of generations in the case of insects with complete metamorphosis:

> Among insects with a more or less complete metamorphosis the crawling larva becomes a quiescent pupa; then from a series of points of the hypodermis of the pupa the organs of the imago are formed, while all the remaining tissues of the pupa degenerate by histolysis and then become ingested by phagocytes. Therefore an adult fly or moth or wasp is an individual quite different from the pupa, an individual produced asexually by the conjunction of a series of buds. This is in every sense as truly metagenetic as the development of a medusa from a polyp (Montgomery).

This is, in a way, true (the word larva, however, should be substituted for pupa in most of the above, as the histoblasts from which the adult parts are derived are already distinguishable and have begun development in the larva), and is suggestive. And the fact

[1] *Trans. Texas Acad. Sci.,* Vol. IX., pp. 75–94.

should have more attention than it seems to get. The whole matter of metamorphosis in insects has been looked at too much from the angle of the systematists, who have found "incomplete" and "complete" metamorphosis a convenient taxonomic character, and of the nature study teachers, who have found it a subject of fascinating interest to children. The true biologic significance of the process has been pretty consistently overlooked. Montgomery does well to recall attention to it and to suggest an interpretation of it of great interest.

However, before accepting this interpretation, or any other, or following it too far, we should be sure we know the actual state of affairs represented to us by the phrase "complete metamorphosis." This commonly suggests, first, the externally obvious, apparently violent and radical changes from larva to pupa to adult, and, second, the interesting internal phenomena of the histolysis of the larval parts and histogenesis of the imaginal parts. But we are very likely to let a type or example of this total performance represent to us the whole range of the phenomenon, which is misleading. For as a matter of fact every gradation can be found among insects from the simple going over, with little or considerable transformation, of larval parts into adult parts, as taken to be characteristic of "incomplete" metamorphosis, to the radical disintegration and disappearance of the larval parts with the fundamental new building of the imaginal parts from isolated histoblasts, taken to be characteristic of and common to all insects of "complete" metamorphosis.

During the last few years, various students in my laboratory (particularly Mr. Powell) and I myself have given some special attention to the phenomena of insect metamorphosis, and have been able to break down any inherited belief of ours (or belief acquired from tradition and text-books) of the discontinuity of "incomplete" and "complete" metamorphosis. We have found insects of incomplete metamorphosis (Hemiptera) showing some of the characteristic phenomena of complete metamorphosis and insects of complete metamorphosis (Coleoptera) showing characteristics of incomplete metamorphosis. And these not as individual variant or aberrant cases, but as conditions characteristic of the development of species.

That is, if the insects with more specialized complete metamorphosis, as flies, ants, etc., are to be looked on as metagenetic in character (*i. e.*, "with a life cycle consisting of two or more individuals with alternation of sexual and asexual reproduction"), and the insects with most generalized incomplete metamorphosis as having a continuous (non-metagenetic) life cycle, the question arises as to where, in the insect class, the difference first appears. And if the whole process of metamorphosis differs in its most specialized and its most generalized states only in degree; if a complete series of intergrading or connecting states exists (as really does); where is the opportunity to interpret this process in the case of certain insects as true metagenesis, and in the case of others as a true continuous non-metagenetic life cycle?

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Botanical Text-Books

It is a pretty dull week when some one does not put out a new botanical text-book intended for high-schools, colleges and universities, and not infrequently these consist of 300 to 600 pages each, covering a wide range of topics. The great diversity of training given in the colleges of our country and of Europe, makes it next to impossible for any capable man to produce a book all sections of which will fit a large number of teachers. I think we may well learn a lesson regarding this multiplicity of books from the teaching of English literature.

Instead of compelling each member of a class to purchase complete sets of Burke, Patrick Henry, Webster or Clay, select speeches of these men are printed separately, which are inspiring and can be used by the students according to their different tastes. So here in botany, why should not some one, by this plan, prepare a considerable number of pamphlets, each suited to the needs of some teacher, which his own judgment will lead him to