In America three expedients have been employed in the accomodation of the new subjects in the four years' college course. At first they were treated as "extras." Later they were admitted on terms of equality with the languages and mathematics, and all suffered some abatement in extent and thoroughness, it being held that elementary knowledge of all was more valuable for the purposes of a liberal education than extended knowledge of the remainder in case of the omission of science. The third expedient is as yet new, but has more than approved itself as the only one that can meet the conditions. I refer, of course, to the elective system. It is liable to abuse, perhaps it has been abused; but, under carefully weighed restrictions, it adds greatly to the culture-power of any curriculum. The disadvantages of the rigid curriculum are too apparent for statement. How many men have not achieved distinction in spite of the inflexible grind of the old college mill. On the other hand, how many single-gifted men have not been headed off and imprisoned in the unvarying meshes of collegiate requirements. Emerson speaks somewhere of "those classes whose minds have not been subdued by school education."

2. Closely associated with the relaxation of the rigidity of the form of education is the new conception of educational values that has resulted from the introduction of science instruction. The study of antiquity has lost somewhat of its prestige as a preparation for the life of to-day. But if the Greek and Roman life and literatures have lost their supremacy in general, they have not lost their disciplinary and quickening power for a certain order of minds. And to erect a scientific curriculum which should rigidly exclude these, as I believe Mr. Spencer proposed, would be a blunder only less disastrous than the reorganization of their old monopoly which was disintegrated by science.

3. I now mention last the catalytic force of science in the curriculum. Its presence has wrought the rejuvenation of the older subjects by supplying the illustration of a new and contagious method. They have acquired a new point of view, and in their treatment the emphasis is not now where it once was. They are immensely the gainers in educational value and in vitality. The ease and promptness with which they have responded to this scientific influence is the best guarantee of their permanence in the scheme of culture. The "new psychology," the "new political economy," and the "new history" may be mentioned as illustrations of this transformation. The Latin and Greek languages are no longer an end in themselves, but merely a means to the reproduction of the wonderful thought and life of the Latin and Greek peoples. Even theology, which, according to Macaulay, is the most rigid and unprogressive of all the systems of human thought, is showing signs of movement in response to the influence of the natural sciences – in particular, of biology.

THE MARINE BIOLOGICAL LABORATORY.—SIXTH SEASON, 1893.

IN addition to the regular courses of instruction in zoölogy, botany, embryology, physiology, and microscopical technique, consisting of lectures and laboratory work under the constant supervision of the instructors, there will be a number of lectures on special subjects, by members of the staff. A course of lectures in Embryology will be given by Professor Whitman; on the Morphology of the Vertebrate Head, by Dr. Ayers; and two or more courses in Invertebrate Zoölogy, by Drs. Bumpus, McMurrich, Rankin, and Morgan. There will also be ten or more evening lectures on biological subjects of general interest. Among those who may contribute these lectures may be mentioned, in addition to the instructors above named, the following: Drs. E. A. Andrews, Johns Hopkins University; Howard Ayers of the Allis Lake Laboratory; Professors W. G. Farlow, Harvard University; William Libby, Jr., Princeton College; J. M. MacFarlane, University of Pennsylvania; C. S. Minot, Harvard Medical School; E. S. Morse, Salem; H. F. Osborn, Columbia College; John A. Ryder, University of Pennsylvania; W. T. Sedgwick, Massachusetts Institute of Technology; E. B. Wilson, Columbia College.

The Laboratory is located on the coast at Wood's Holl, Mass., near the laboratories of the United States Fish Commission. The building consists of two stories, and has 33 private laboratories for investigators and 5 general laboratories — two for beginners in investigation in zoölogy, one for teachers and students receiving instruction in zoölogy, one for botany, and one for physiology. The Laboratory has aquaria supplied with running sea-water, boats, a steam launch, collecting apparatus, and dredges; it is also supplied with reagents, glassware, and a limited number of microtomes and microscopes. *No alcohol can be supplied beyond what is required for work in the laboratory.*

By the munificence of friends the library will be provided not only with the ordinary text books and works of reference, but also with the more important journals of zoölogy and botany, some of them in complete series.

The Laboratories for Investigators will be open from June 1 to Aug. 30. They will be equipped with aquaria, glassware, reagents, etc., *but microscopes will not be provided.* In this department there are 33 private laboratories for the exclusive use of investigators.

Those who are prepared to begin original work under the guidance of instructors will occupy tables in the general laboratories for investigators, paying for the privilege a fee of fifty dollars. The number of such tables is limited to 20.

An elementary course in vertebrate embryology will be introduced this season, designed to meet the needs of those who have completed the general courses in the Students' Laboratory. The study will be confined mainly to the fish egg as the best type for elucidating vertebrate development. Each member of the class will be supplied with material and be expected to work out each step in the development from the moment of fecundation. The aim will be not only to master the details of development but also to acquire a thorough knowledge of the methods of work. Methods of preparing surface views, imbedding in paraffin and celloidin, various methods of staining and mounting, drawing, reconstruction, modelling, etc. The course will thus combine just what is needed as a preparation for investigation.

This course will open Wednesday, July 5, and continue six weeks, and it will be conducted by Mr. Lillie and Professor Whitman. The fee for this course will be fifty dollars, and the class be limited to ten.

Applicants should state what they have done in preparation for such a course, and whether they can bring a complete outfit, viz., a compound microscope, a dissecting microscope (the Paul Mayer pattern made by Zeiss is the best), camera-lucida, microtome, etc. In case these instruments are furnished by the Laboratory, an additional fee of ten dollars will be charged therefor. No applications for less than the whole course will be granted.

The Zoölogical Laboratory for teachers and students will be opened on Wednesday, July 5, for regular courses of six weeks in zoölogy and microscopical technique. The number admitted to this department will be limited to fifty, and preference will be given to teachers and others already qualified. By permission of the director and by the payment of additional fees, students may begin their individual work as early as June 15, but the regular instruction will not begin before July 5.

Though more advanced students who may wish to limit their work to special groups will have an opportunity to do so, the regular course in zoölogy, in charge of Professor Bumpus, will embrace a study of the more typical marine forms and elementary methods of microscopical technique. The laboratory work, outlined below, will be accompanied by lectures.

July 5–8. Study of the Lobster. (General anatomy — methods of injecting — preparation of histological material.) July 11–15. Cœlenterates (*Campanularia, Tubularia, Metridium, Mnemeopsis*). July 17–22. Vermes (*Nereis, Balanoglossus,* and *Phascolosoma, Polyzoa, Bdelloura*). July 24–29. Echinoderms (*Asterias, Arbacia, Echinarachnius, Thyone*); Mollusks (*Venus, Sycotypus, Loligo*). July 31–Aug. 5. Crustaceans (*Branchipus, Pandarus, Lepas, Idotea, Talorchestia, Cancer, Limulus*). Aug. 7–15. Vertebrates (*Amphioxus, Raja, Teleost*).

The tuition fee is thirty-five dollars, payable in advance. Ap-

plicants should state whether they can supply themselves with simple and compound microscopes, or whether they wish to hire. Microscope slides, dissecting and drawing implements, bottles, and other supplies, to be finally taken away, are on sale at the Laboratory. Further information in regard to this department may be had by addressing Professor Hermon C. Bumpus, Wood's Holl, Mass., to whom applications for admission should also be made.

The Botanical Laboratory for Teachers and Students will be opened on Wednesday, July 5. The laboratory work in botany will be restricted to the study of the structure and development of types of the various orders of the Cryptogamous plants. Especial attention will be given to the study of the various species of marine Algæ which occur so abundantly in the waters about Wood's Holl, and students desiring to give their entire attention to these plants will be encouraged to do so. The fungi and higher Cryptogams will receive less attention than the Algæ, but will be studied in fewer types. Lectures will accompany the laboratory work. The course may be outlined somewhat as follows:—

First week. *Cyanophyceæ:* Lyngbya, Calothrix, Rivularia, Stigonema, Tolypothrix, Anabæna. Second week. *Chlorophyceæ:* Spirogyra, Ulva, Enteromorpha, Chætomorpha, Bryopsis, Vaucheria, Oedogonium; *Phæophyceæ:* Ectocarpus. Mesogloia, Leathesia, Laminaria, Fucus, Sargassum. Third week. *Rhodophyceæ:* Batrachospermum, Nemalion, Callithamnion, Chondriopsis, Rhabdonia. Fourth week. *Phycomycetes:* Mucoe, Sporodinia, Peronospora, Cystopus, Achlya; *Uredinei:* Aecidium, Uredo, Puccinia, Uromyces. Fifth week. *Basidiomycetes:* Agaricus, Lycoperdon; *Ascomycetes:* Microsphæra, Sordaria, Peziza, Physcia. Sixth week. *Muscineæ:* Riccia, Madotheca, Marchantia. Mnium, Tetraphis, Hypnum; *Filicineæ:* Dicksonia, Adiantum, Equisetum, Lycopodium, Marsilia, Selaginella.

The tuition for students in the regular course of laboratory work and lectures is thirty-five dollars, payable in advance; for students engaged in investigation the tuition is fifty dollars.

Students are expected to supply their own instruments, or to pay an extra fee for those borrowed from the Laboratory. Applications should be addressed to William A. Setchell, 2 Hillhouse Avenue, New Haven Conn.

The Botanical Laboratory will be open from June 1 to September New investigators

Room accommodation two persons, may be obtained near the Laboratory at prices varying from $3 to $4 a week, and board from $4.50 to $6. By special arrangement, board will be supplied to members at The Homestead at $5 a week.

A Department of Laboratory Supply has been established in order to facilitate the work of teachers and others at a distance who desire to obtain materials for study or for class instruction. Certain sponges, hydroids, starfishes, sea urchins, marine worms, crustaceans, mollusks, and vertebrates are generally kept in stock, though larger orders should be filed sometime before the material is needed. Circulars giving information, prices, etc., may be obtained by addressing the collector, F. W. Walmsley, Wood's Holl, Mass.

Wood's Holl, owing to the richness of the marine life in the neighboring waters, offers exceptional advantages. It is situated on the north shore of Vineyard Sound, at the entrance to Buzzard's Bay, and may be reached by the Old Colony Railroad (2¼ hours from Boston), or by rail and boat from Providence, Fall River, or New Bedford. Persons going from Boston should buy round-trip tickets ($2.85).

The Annual Report of the Trustees, containing an account of the organization and work of the Laboratory, may be obtained from the secretary, Anna Phillips Williams, 23 Marlborough St., Boston.

The officers of instruction are: C. O. Whitman, director, head professor of zoölogy, University of Chicago, editor of the *Journal of Morphology*. Zoölogy — A. Investigation, Howard Ayers, director of the Allis Lake Laboratory; J. Playfair McMurrich, professor of biology, University of Cincinnati; E. G. Conklin, professor of biology, Ohio Wesleyan University; F. R. Lillie, fellow in zoölogy, Chicago University. B. Instruction, H. C Bumpus, professor of comparative anatomy, Brown University; W. M. Rankin, instructor in zoölogy, Princeton College; Pierre A. Fish, instructor in physiology and anatomy, Cornell University; A. D. Mead, fellow in zoölogy, University of Chicago. Botany — W. A. Setchell, instructor in botany, Yale University; W. J. V. Osterhout, Brown University. Physiology — Jacques Loeb, assistant professor of physiology, University of Chicago. Ryoiche Takano, artist; F. W. Walmsley, collector; and G. M. Gray, laboratory assistant.

ELECTRICAL NOTES.

THE paper by Dr. Sumpner on "The Diffusion of Light" is one of the most important pieces of work which has recently been published, especially from the practical side. It shows us at once how to calculate the amount of light necessary to illuminate a room of any shape or size, provided only that we know the material used for decorating it. Hitherto this has been done on the happy-go-lucky plan, for, although a rule has been laid down by Mr. Preece to the effect that one candle-power should be used for every square foot of floor space, the well-known antipathy which mathematics bears to Mr. Preece has caused this formula to be looked upon with suspicion; and in this case with reason. The work of Dr. Sumpner is, however, of an entirely different class, and his results may be depended upon for making practical calculations. The principal result of his work is a knowledge of the immense effect that the material covering the walls of a room has on the amount of light required to illuminate it to a given degree. We learn that the amount of light reflected from a newspaper or piece of foolscap is equal, within 10 per cent, to that reflected from a good glass mirror. The following figures may be of interest (deduced from his results):—

I.	II.
Black cloth,	100
Dark-brown paper,	87
Blue paper,	72
Yellow paint (clean),	60
Wood (clean)	50
Wood (dirty),	80
Cartridge paper,	20
Whitewash,	15

Column I. gives the material covering the walls of the room of a given size, and column II. the proportionate number of candles necessary to light it. It will be seen that it takes nearly six times as much candle-power to illuminate a room papered with dark-brown paper as it does to illuminate to an equal degree a whitewashed room. While, of course, we cannot sacrifice æsthetics to economy, it is evident that by suitably choosing the paper of a room, no inconsiderable saving in gas bills may be effected.

R. A. F.

NOTES AND NEWS.

A NEW society has been organized in Washington under the name of the "Geological Society of Washington." The officers are: President, C. D. Walcott; vice-presidents, S. F. Emmons and W. H. Holmes; secretaries, J. S. Diller and Whitman Cross; treasurer, Arnold Hague; council, G. F. Becker, G. H. Eldridge, G. K. Gilbert, G. P. Merrill, and T. M. Chatard. The members are classified as resident and corresponding, the dues of the former being $2 and of the latter $1 per annum. The meetings are held on the second Wednesday of each month from October to May, inclusive. The membership already numbers 108. The members need not be geologists themselves: to have an interest in the subject is sufficient to entitle one to the privileges of the society. Its object is the presentation of short notes on work in progress rather than the reading of elaborate papers. The first scientific meeting was held March 8, at which, after an introduction by Major J. W. Powell, Director of the Geological Survey, a paper was presented by Mr. H. W. Turner, on the Structure of the Gold Belt of the Sierra Nevada. Mr. S. F Emmons then read a paper on the Geological Distribution of Ore Deposits in the United States.