offering of agricultural subjects in the high schools, and that advantage will be taken of this opportunity by a considerable number of pupils. Several of the schools have shown an interest in agricultural work and desired to introduce it, but have been deterred by the necessity of meeting the requirements in the subjects credited.

A somewhat conditional victory in this direction has also been gained in New York state. There the state regents of education determine what subjects are to be credited in the regents' examinations for entrance to colleges or universities in the state, and agriculture has not been included in the list. Naturally no other subjects would be offered at high schools except as electives, and pupils fitting for college would not be likely to take such elective studies with no chance for credit. This has handicapped the college of agriculture at Cornell in its efforts to extend the teaching of nature study and elementary agriculture in the public schools, and that institution has brought its influence to bear upon the regents of education. At a meeting held last winter the regents decided to allow credits in the regular high school courses for nature study and elementary agriculture, provided the courses in these subjects were so prepared as to show educational values comparable with other subjects now recognized. Since this announcement the faculty of the college of agriculture has been at work on the syllabi of courses in the subjects under consideration, with a view to securing their approval by the board of regents. In that case it is expected that several of the high schools will offer elective courses in agriculture, which will enable them the better to prepare students for the higher agricultural work of the college.

It was the contention at the meeting of the Association of American Agricultural Colleges and Experiment Stations at Des Moines last fall, that the public schools should lead up to the agricultural colleges as they now do to colleges of arts and sciences; and President Jesse explained that in Missouri 'we are risking our entire future on the doctrine that the college of agriculture should rest on the public high school, and we are going to make the public high school agricultural so far as it ought to be agricultural.' The recognition of agriculture as a teaching subject and as having an educational value will do much to bring about this desired end. It will bring elementary and advanced work in agriculture closer together, and will articulate the agricultural college and the high school as they have not been before.—*The Experiment Station Record.*

BOTANICAL NOTES.

MORPHOLOGY OF THE EAR OF INDIAN CORN.

MR. E. G. MONTGOMERY, of the University of Nebraska, in a paper soon to be published, offers a new explanation of the morphology of the 'ear' of Indian corn (*Zea mays*). Briefly stated it is that the ear corresponds to the central spike of the tassel. This normally bears from four to eleven rows of paired spikelets. In the staminate inflorescence one of the spikelets in each pair is sessile, and the other stalked, but in their transformation to the pistillate structure the pedicel of the stalked spikelet becomes shortened more and more until it is sessile, thus forming a double row of kernel-producing spikelets, and accounting for the fact that the ear always has an *even* number of rows. Hermaphrodite flowers are common in such transformed spikelets.

A NEW BOTANICAL TEXT-BOOK.

UNDER the name of 'A College Text-book of Botany' Professor Atkinson has brought out (Holt & Co.) an enlargement and considerable improvement of his 'Elementary Botany' (1898). In it the author has attempted to present an outline of the science in a form sufficiently condensed to be readily covered by college students in the time usually allotted to botany in the better class of colleges and universities. The book differs from most of those hitherto prepared in the sequence of topics, beginning with physiology, to which thirteen chapters (135 pages) are assigned. Following this are twenty-four chapters (213 pages) on the morphology of plants. Eight chapters (115 pages) are given to 'Plant Members in Relation to their Environment,' fol-

lowed by twelve chapters (184 pages) on 'Vegetation in Relation to Environment.' Seventy-five pages (9 chapters) are given to the structure and classification of angiosperms. A useful appendix contains suggestions as to the collection of material, the selection of apparatus, reagents, reference books, etc. One has but to note the space given to the subdivisions of the science to realize the change which has taken place in our conception of its scope, and the relative importance of its departments. Roughly speaking, 20 per cent. of the book is given to physiology, 30 per cent. to morphology, 40 per cent. to ecology and but about 10 per cent. to classification. The college student who successfully covers the subject as presented in this book will have a very good introduction to the several departments of the science.

The general decapitalization of generic names when used alone strikes one rather oddly, as when we find spirogyra, vaucheria, uncinula, rhabdonia, riccia, marchantia, etc. Even family names may suffer decapitalization, as 'gramineæ' (p. 658).

KARSTEN AND SCHENCK'S VEGETATIONSBILDER.

QUITE recently several more fascicles of this admirable publication of photographs of vegetation have been received from the publisher, Gustav Fischer, of Jena. As in the earlier fascicles noticed in SCIENCE for April 7, 1905, each of these contains six fine reproductions of photographs accompanied by full explanatory text. Thus fascicle 1, of Series III., contains six photographs by E. Ule of ant nests (Blumengärten) in Brazilian vegetation; fascicle 2, six photographs by Dr. E. A. Bessey, of vegetation in Russian Turkestan (1, moving sand dunes on the Amu Daria River; 2, sand dunes held by Calligonum, Salsola, and Tamarix; 3, *Tamarix laxa* and *Salsola arbuscula;* 4, *Haloxylon ammodendron* and *Salsola arbuscula;* 5, *Calligonum arborescens;* 6, *Cuscuta engelmanni* on a quince tree). The third fascicle is by Dr. M. Busgen, Dr. H. Jensen and Dr. W. Busse, and includes photographs of vegetation in middle and eastern Java. Of these the most striking are those of the teak and bamboo forests. The low price of these beautiful plates (2.50 Marks per fascicle) should enable every botanist to own a complete set.

FURTHER PLANT CELL STUDIES.

SEVERAL months ago (July 7, 1905) parts I. to IV. of Dr. B. M. Davis's 'Studies on the Plant Cell' were noticed in these columns. Since that notice was written two more parts have appeared (*American Naturalist,* July and August). They are devoted to a discussion of cell activities at critical periods of ontogeny in plants, which are taken up under several heads: (1) Gametogenesis (in which we find the suggestion that 'the most satisfactory theory of the origin of sex in plants regards primitive gametes as weaker or lacking in the potentialities of vegetative growth, and conjugation as a mutually cooperative process resulting in a rejuvenescence of the protoplasm'); (2) fertilization (in which the author suggests a narrower conception of the act, by excluding 'vegetative fertilization'); (3) sporogenesis; (4) reduction of the chromosomes (in which much new matter is here incorporated in a concise statement); (5) apogamy (under which he discusses parthenogenesis); (6) apospory; (7) hybridization (in which we find this significant sentence—"the phenomenon of hybridization is far too complex to be explained in terms of simple ratios, and while some characters may be paired or correlated in proportions that can be expressed by mathematical formulæ, there is little probability that the assemblage of characters which make species can be so definitely grouped as the strongest disciples of Mendel may hope"); (8) xenia ('the immediate or direct effect of pollen on the character of seeds and fruits'). Under the last title it is stated that 'the best understood examples of xenia are found in the hybrids of maize.' The whole discussion in these two parts covers ninety-six pages, and includes a bibliography of 152 titles.

A STUDY OF INSECT GALLS.

DR. M. T. COOK, now of the Agricultural Experiment Station at Santiago de las Vegas, Cuba, has brought together in orderly form what is known as to the Indiana plant galls

produced by insects, and this has been published in the 29th Report of the Department of Geology and Natural Resources of Indiana, and also issued as a seventy-page 'separate.' The plan of this brochure is as follows: (1) a short historical section, (2) biology and classification of gall-insects, (3) morphology of galls, (4) causes inducing gall formation, (5) a systematic account of Indiana galls, (6) bibliography. Illustrations from drawings and photographs serve to make the descriptions easier to follow.

This little booklet should stimulate interest in these curious structures, about which there has been practically nothing written in this country in any systematic or connected way until Dr. Cook took up the matter. He is now at work on a monograph of the insect galls of North America, in which the galls will be classified with reference to the host plants, and the treatment is to be primarily from the standpoint of the plant pathologist. It is to be hoped that botanists and entomologists will help in this undertaking by sending him specimens of all kinds of galls from different localities.

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TECHNICAL EDUCATION IN AUSTRALIA.[1]

The necessity for providing the means of imparting technical education has been unreservedly acknowledged in each of the states of the Australian Commonwealth, the annual combined expenditure in this direction being over £60,000, exclusive of the cost of land, buildings, etc. In Sydney, after successful experiments in the formation of classes by one of the state subsidized educational institutions, a technical education board was established, which did good work until 1889, when the state government assumed control of the movement, the work of technical education being handed over to the state department of public instruction. The technical college, forming the headquarters of the system, is one of the leading architectural features of Sydney. The fronts of the main structure are ornamented with Romanesque carvings in white stone, showing representative flora and fauna of Australia. The main entrance is formed by a triple arch, with two center columns of polished bluestone or trachyte, flanked by two pilasters of the same material. The main building to which access is thus gained has three floors and a half-basement, and contains 28 rooms, many well lighted, lofty and suitable class-rooms. There is a chemical laboratory, and at the rear of the main structure are electrical engineering, plumbing, sanitary engineering, blacksmiths' shops and well-equipped general engineering shops. In 1903 there were 477 technical classes in operation, of which 243 were held in Sydney and suburbs and 234 in the country districts, while there were in addition 86 classes held in connection with the public schools. The number of individual students under instruction during the year was 13,232, and the average weekly attendance 8,671. In 1896 a technical college was opened at Newcastle, and a new college at Bathurst in June, 1898. In 1902 a technical school was built at Lithgow, and mechanical engineering shops provided at Newcastle. During the year the expenditure by the government on technical education amounted to £26,459, exclusive of expenditure on the technical museum and branches. Fees to the amount of £8,707 were received from the students. In Victoria much has been done in promoting the work of technical education, a patriotic Victorian having assisted the earlier stages of the movement by giving £15,500 towards the establishment of a workingmen's college. In 1903 there were eighteen schools of mines and technical schools receiving aid from the state. The total state expenditure during the year was £16,430, and the fees received from students amounted to £11,741. The average number of students enrolled was 3,173. In addition, classes in manual training and in cookery and domestic economy are held at various centers, the net expenditure on these branches amounting in 1902–3 to £3,437. In South Australia the Adelaide School of Design in 1903 had 577 students. There were also branch schools at Port Adelaide and Gaw-

[1] Communicated to the *Journal of the Society of Arts* by Mr. John Plummer, of Sydney.