vance along the lines of scientific investigation which is being made in Spain under the wise and intelligent guidance of its enlightened sovereign. There was a time, not so long ago, when we did not look to Spain for advanced information along purely scientific lines; but that day has passed, and there has arisen in her institutions of learning a generation of young men trained in the most modern methods of observation and research, who are destined to give this noble people as high a standing in the realms of science as has been achieved by the students of other lands. Among the young men who are working successfully in this direction none stands higher than the indefatigable and talented author of the work before us.

W. J. Holland

Carnegie Museum,
December 28, 1914

The Modern High School: Its Administration and Extension. Edited by Charles Hughes Johnston, Ph.D. (Harvard), Professor of Secondary Education in the University of Illinois. New York: Charles Scribner's Sons, 1914. Pp. xviii + 847.

The present work is a companion volume to "High School Education" which appeared two years ago under the editorship of Professor Johnston. The earlier book deals with the evaluation and organization of high-school studies; the present with the social administration of the high school. A third volume is announced which will treat the problem of supervision, especially that of class teaching.

In the volume under review, the editor has sought to make the cooperative plan of treatment yield a well-organized body of material bearing upon the chief problems of high-school administration. He frankly takes the position that the primary purpose of the high school is utilitarian and social: in a democracy like ours, high-school education is a necessity and not a luxury. Even the secondary functions, such as the cultural, esthetic, moral and religious, must be worked over in the light of modern social needs and social ideals. The conscious purpose of the editor, therefore, has been threefold: first, to establish more firmly the idea that the aim of the high school is social; second, to determine the relation of the high school to the other educational agencies of a democracy; and, third, to show, largely through the interpretation of concrete examples, how the work of students might be so administered that it would have the maximum socializing effect upon them. The thirty chapters are written by twenty-eight different authors, representing the various groups of specialists interested in high-school problems.

Part I. deals with "The Institutional Relationships of the High School." A chapter here is devoted to each of the following topics: the high school as a social enterprise; the legal status of the high school; business efficiency in high-school administration; the relation of the high school to the elementary school, to the college, and to the industrial life of the community. The contributors of these chapters are Dr. Snedden and Mr. Kingsley of the Massachusetts State Board of Education; Mr. Hanger, superintendent of schools, Rossville, Kansas; Mr. Josselyn, associate professor of school administration, University of Kansas; and Dr. Carlton, professor of economics and history, Albion College. In the discussion of the second and third topics, the need of expert service in both state and local school administration is forcibly brought out. Mr. Josselyn's treatment of the articulation of the high school to the elementary school is based upon the idea that waste must be eliminated in the lower grades and that the upper grade work must be differentiated so as to integrate with the different lines of work now being offered in the high school. His charts upon the latter point are suggestive. Mr. Kingsley's discussion of the relation between high school and college contains one interesting suggestion; namely, that the high school ought to help the students select their colleges or universities and then guide their election of studies to this end. Perhaps the most difficult relationship of all, that of the high school to the industrial life of the community, receives but twenty of the two hundred and eight pages in this part. However,

the long chapter on continuation work later in the book supplements this and might have been included here.

Part II., entitled "The More Intimate Specialized Relationships of High School Work," has to do with the socialization of the curriculum, class-room management and study, and with the bringing of the home and community into more vital relationship. The authors of these chapters are Dr. Scott and Miss Williams, of the Boston Normal School; Mr. Hall-Quest, assistant in education, University of Illinois; Mr. Wiener, principal of Central Commercial and Manual Training High School, Newark, New Jersey; Mary V. Grice, founder of Home and School League, Philadelphia; and Mr. Olinger, principal Westminster Hall, Lawrence, Kansas. These chapters are rich in illustrative material. The chapter by Miss Williams describing the way she transformed her class in physiology into an active social group for the investigation of vital questions in community hygiene should be read by every high-school teacher. In Mr. Hall-Quest's article on the direction of study, all the chief schemes of "supervised study" are reviewed. The chapter by Mary V. Grice on the "Home and School Association" is exceptionally strong because of its pointed and practical suggestions.

Part III. takes up the "Definite Internal Expressions of the Social Nature and Socializing Function of the High School." The topics treated are the internal government of the school, the improvement of teachers in service, the guidance of the social activities of the high school, athletics, debating, school paper and fraternities. The social point of view is consistently followed in all the discussions. A large number of different means of dealing with these activities now in operation are described. The chapter on "High-School Journalism" is well worth careful reading by any one on the advisory board of a school paper.

Part IV. brings together a group of "Additional Socializing Functions of the Modern High School." The following are the topics with authors: The High School as a Social Center, by Dr. Perry, of the Russell Sage Foundation; Continuation Work, by Dr. Davis, University of Michigan; High-School Library, by Florence Hopkins, librarian Central High School, Detroit; Vocational Guidance, by Meyer Bloomfield, director of Boston Vocation Bureau; Avocational Guidance, by Dr. Ruediger, of George Washington University; Cooperation in the Teaching of English, by Professor Hosic, of Chicago Normal; High-School Hygiene, by Dr. Rapeer, New York Training School; The School as an Art Center of the Community, by Ella Bond Johnston, chairman art department, General Federation of Women's Clubs; The Moral Agencies affecting High-school Students, by Mr. Hanna, state supervisor of High Schools, Illinois; and The Religious Life of the High School Student, by Professor Wilm, of Wells College. For the average teacher and principal, certain of these chapters are especially helpful, since they contain vital material on topics comparatively new. Notable in this respect are the treatments of the high-school library, the high school as an art center, avocational guidance and cooperation in the teaching of English.

In spite of the clear purpose in the editor's mind, the cooperative method of treatment has failed in one respect. Most of the contributors lay the theoretical groundwork for their discussion; and while the material is good, the reader still finds himself becoming very tired of repetitions. If close readers alone were to use the book, one hundred and fifty pages or more might be eliminated without doing great violence to the work. The part headings, too, are somewhat artificial and strained and go little way toward helping establish standard captions under which to discuss school administration. Aside from these weaknesses, the book contains the best body of assembled material on high-school administration. Excepting a small number of the more general chapters and a considerable number of introductory paragraphs in others, the editor has realized his purpose—"a survey of policies, examples and suggestions of ways and means of making

the strictly socializing work of our actual high schools more definite, more effective and more nearly universal." The sixty-seven pages of bibliography at the close of the book deserve the highest praise. The titles are carefully selected, well arranged, and in part annotated. The editor has rendered a great service to students of secondary education, especially those offering courses in the subject.

Clayton C. Kohl

PLANT AUTOGRAPHS[1]

The importance of investigations on physiology of plants lies in the fact that it is only by the study of the simpler phenomena of irritability in the vegetal organisms that it is possible to elucidate the more complex physiological reactions in the animal. The difficulty of investigation lies in the apparent immobility of the plant. It is often impossible by visual inspection to distinguish even between specimens, one of which is alive and the other killed. Means have, therefore, to be discovered by which the plant itself is made to reveal its internal condition, and changes of that condition, by characteristic signals recorded by it. These responsive reactions may manifest themselves in change of form or in change of electric conditions. In his investigations the author has employed both methods of mechanical and electric response.

In recording mechanical response great error is introduced from friction of the writer against the recording surface. This has been overcome in the author's Resonant Recorder, where the record consists of a series of intermittent dots due to the vibration of the writing point. In this manner it is possible to record time-intervals as short as a thousandth part of a second. Moreover in order to eliminate completely all personal equation, the apparatus has been made perfectly automatic. Thus the plant attached to the recording apparatus is automatically excited by a stimulus absolutely constant. In answer to this it makes its own responsive record, goes through its period of recovery and embarks on the same cycle over again without assistance at any point from the observer.

Mimosa exhibits a remarkable periodic variation of excitability; the response being practically abolished in the early hours of the morning, the sensibility is gradually increased to a maximum by noon. The latent period of the leaf is one six hundredth part of a second. Crucial tests of the excitatory character of transmitted impulse are afforded by physiological blocks produced by the local application of cold, of poison and electrotonic block. These prove that the transmission of excitation in *Mimosa* is a process fundamentally similar to that occurring in the animal. The effects of drugs on plants are remarkably similar to the effects on animal tissues. The characteristics of the rhythmic tissues in animals and plants are precisely similar. There is hardly a single phenomenon of irritability observed in the animal, which is not also to be found in the plant.

[1] Abstract of a paper read before Section G of the American Association for the Advancement of Science at the Philadelphia meeting, by Professor J. C. Bose.

SPECIAL ARTICLES

INHERITANCE IN THE HONEY BEE

More or less time has been devoted by the writer, during the past four years, to a study of inheritance in the honey bee, as a project under the Adams Fund. Innumerable obstacles to the progress of this investigation have presented themselves, but sufficient data have accumulated to justify the announcement of a few interesting points.

The matings have been made, for the most part, at an isolated mating station on the Gulf Coast prairie, about forty miles northwest of Houston, Texas. The location of the station is almost ideal for this purpose, for there are no trees or shrubs affording shelter for bees and no bees occur except those purposely taken to the mating station.

The matings thus far have been confined to crosses between the Italian and Carniolan races. As is well known, the pure bees of the former race are distinctly yellow, while those of the latter are more or less gray, but always, when pure, devoid of yellow color. For the