sions, freely provided for the entertainment of the two Associations by the railroads and citizens of California, were much appreciated by the delegates, who were thus enabled to learn many important things regarding the wonderful natural resources and industrial development of California, which the ordinary tourist does not become acquainted with.

A. C. TRUE.

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*INTERNATIONAL CONFERENCE ON HYBRIDIZATION.**

AT the Royal Horticultural Society's gardens at Chiswick, on July 11th, an International Conference was opened for the purpose of discussing 'Hybridization and the Cross-breeding of Varieties.' There were present representatives of the government of the United States and of most of the European countries, besides a large number of British hybridists and botanists. An interesting and unique exhibition of plants and flowers had been arranged in the vinery. All the exhibits were received under condition that they were 'a new species or new variety.' Most of the plants bore a card which stated the name of the hybrid or cross-bred, the name of the female or seed parent, the name of the male or pollen parent, and remarks on variation, size, form and color. Sir Trevor Lawrence, the President of the Royal Horticultural Society, welcomed the members of the Conference, and mentioned that the King of the Belgians had conferred upon Dr. Maxwell Masters, F.R.S., who later on took the chair at the Conference, the insignia of an officer of the Order of Leopold.

At the sitting of the Conference Dr. Maxwell Masters, in opening the proceedings, gave an address on the history of hybridization. He said they had met to discuss the most important problem of modern progress in experimental horticulture. Apart from scientific experimental horticulture he did not think that they had progressed at all, as far as the practical details of cultivation were concerned, beyond what their forefathers had done. But when they came to scientific experimental work their forefathers were nowhere. If they went into present-day gardens they found that nine-tenths of the plants were the productions of the gardener's art, and not natural productions. There was a time when they took an interest in new plants introduced from the tropics and elsewhere; but now the Horticultural Society's flower shows at the Drill-hall, Westminster, did not produce anything new more than once or twice in a year. The so-called new plants now exhibited were the products of the gardener's art. Referring to the discussions in the early part of the 18th century as to the question of sexes in plants, he said that the first person in this country or any other who formed an artificial hybrid purposely—many people must have produced them unconsciously before that time—was Thomas Fairchild, who must be known to many people as the originator of the flower sermons now so common in many churches. The hybrid which he produced was a cross between a sweet william and a carnation pink, and something very much like it was still in existence. From that time, however, progress was slow until Linnæus was struck with the same phenomenon; while Thomas Andrew Knight, a former President of the Royal Horticultural Society, and Dean Herbert were celebrated for their work in the same direction. In their day there was a great prejudice against hybridization among certain religious people. It was said that by the cross-breeding of plants people were flying in the face of Providence and that the process was wicked. But Dean Herbert showed that by crossing two species of daffodils which he found on the Pyrenees he could produce

*From reports in the London *Times*.

flowers similar to those which abounded in that locality; and he, therefore, argued that if Nature did the same thing he must not be blamed for doing what Nature did. The prejudice against hybridization was carried so far that nurserymen were afraid to exhibit hybrid plants in the Royal Horticultural Society's gardens, because they might injure the feelings of some over-sensitive religious persons; and they, therefore, exhibited them as wild species from abroad. Dean Herbert did much to break down that prejudice. They now had to meet a prejudice of another kind, of which he felt ashamed. He meant the prejudice which existed in the minds of some botanists against hybridization. He could understand how vexed botanists were to find their pretty little systems upset by the proceedings of hybridists. But he thought it was far preferable to uphold the interests of science and truth than of their petty systems. After referring to Darwin's views on species, he said that the question of species, as they understood it, was merely an individual opinion, and that there was no dividing-line between species, varieties and genera. And as to crossing between species not being hybridizing, as some persons asserted, he said that they desired to deal with hybridization in its widest sense, in the full confidence by so doing they would be not only advancing science, but also adding enormously to the welfare of humanity.

Papers were then read on 'Hybridization and Cross-breeding as a Method of Scientific Investigation,' by Mr. W. Bateson, F. R. S., Cambridge; 'Hybridization as a Means of Pangenetic Infection,' by Professor Hugo de Vries, Amsterdam; 'Hybridization and its Failures,' by the Rev. Professor George Henslow, London; 'Progress of Hybridization in the United States of America,' by Professor L. H. Bailey, Cornell University, U. S. A.; and 'Experiments in Hybridization and Cross-breeding,' by Mr. C. C. Hurst, Burbage, Hinckley.

The chair was taken by Professor G. Henslow on July 12th, who, in his opening remarks, said that these meetings were of great value, because they connected together scientific and practical work. The questions dealt with applied not only to hybridization, but also to all parts of botany; and botanists would be only too thankful to get hold of facts with which the horticulturist was familiar.

Mr. Herbert J. Webber, from the United States Department of Agriculture, gave an interesting lecture, with lantern demonstration, on the work of his department in plant hybridization. He said that the work of hybridizing was started not more than three years ago, and the results attained were far from complete. All the plants on which they had worked were, in the main, horticultural products of America, and one of the principal was the orange plant. A few years ago almost the entire orange industry for a season in Florida was destroyed by frost in a single night, and about a hundred million dollars was lost by the damage done. In consequence of this they arrived at the conclusion that either they must abandon the orange industry in Florida or secure a variety of orange which was very much hardier and which would resist the frost. Accordingly, they set to work to hybridize the Japanese orange, *Citris trifoliata*, with the sweet orange. The *trifoliata* was found as far north as New York, and was used as a hedge plant. The fruit was bitter and resinous, and was used as a preserve fruit; but the plant was hardy in character, and by hybridizing it with the common sweet orange it was hoped that the frosts would be resisted and that they might obtain hybrids of the two species and a deciduous as well as an evergreen orange. After illustrating the new plants by means of the

lantern, Mr. Webber said that the true hybrid plants had been found very much more vigorous than the common sweet orange. His department had also made experiments with the view of combining the character of the tangerine with the common orange in order to secure, if possible, the loose skin of the tangerine with the common variety. The sweet orange was of much better quality and more desirable than the tangerine, but if by hybridizing they could produce a fruit to combine the characters of the two he thought that such a fruit would take the market; and they were working on those lines. They were further endeavoring to improve the quality of the orange by crossing the bitter-sweet pomelo with the sweet orange. He gave illustrations of the different foliage and developments of the plants brought about by hybridizing. The United States Agricultural Department had, he said, also been working more or less with pineapples; and he pointed out that it had been ascertained that by the crossing of fruits which were commonly seedless they could frequently produce seeds, and that the plants so dealt with were more vigorous and better able to resist disease. Another branch of their work was with cotton plants, the main point being to hybridize between the Upland cotton and the so-called Sea Island cotton. The improvements obtained Mr. Webber illustrated by means of the lantern slides, and said that by this hybridization they hoped to extend the cotton industry considerably. The last experiment dealt with by the lecturer was the hybridization of corn (maize) by introducing the wild species into the cultivated strain. They were endeavoring to cross the common maize with the wild Mexican grass Theosinth, which was supposed to be the progenitor of maize; but, of course, there must be numerous generations before they could bring out the character of the corn to any great effect.

The following papers were also read: 'The Structure of certain New Hybrids (Passiflora, Albuca, Ribes, Begonia, &c.),' with lantern demonstration, by Dr. J. H. Wilson, St. Andrews; 'Hybridization viewed from the standpoint of Systematic Botany,' by Mr. R. Allen Rolfe, Kew; 'Hybrid Poppies,' by M. Henry de Vilmorin, Verrieres; 'Self-Fertilization of Plants,' by M. Lemoine, Nancy; 'Hybrid and Cross-bred Fruits,' by Mr. Luther Burbank, San Rosa, California, U. S. A.; and Mr. T. Francis Rivers, Sawbridgeworth.

The festival dinner of the Conference was held at the Whitehall Rooms, Sir Trevor Lawrence presiding. The toast of 'The Queen, Patron of the Society,' having been honored, the Rev. Professor Henslow proposed 'Horticulture,' and Mr. H. J. Webber, in responding, said he brought with him the friendly greeting of the United States Secretary of Agriculture. He added that he hoped to see the time when the originator of a new fruit or flower, in addition to the satisfaction he might feel in conferring a benefit on humanity, would receive the just and practical recompense to which he was entitled. Professor Hugo de Vries (Amsterdam University) and M. Henry de Vilmorin also responded. Mr. Bateson proposed the toast of 'Hybridists,' Mr. W. T. Swingle (Washington) responding. The Master of the Rolls gave 'The Royal Horticultural Society,' and referred to the early work of the Society in sending out investigators into various parts of the world. The Chairman, in reply, said it was owing to the work of Robert Fortune, who was sent by the Society into China, that the cultivation of the tea plant was introduced into India and Ceylon and an immense trade was thus almost wholly transferred from China. The Society, which was founded in 1804, would soon have to consider how it was to celebrate its century. Of late years the Society had been progress-

ing by leaps and bounds, but it needed a hall in London and a new garden in place of the old garden at Chiswick. The Belgian Minister responded for the visitors.

SCIENTIFIC BOOKS.

German Higher Schools: the History, Organization and Methods of Secondary Education in Germany. James E. Russell, Ph. D., Dean of Teachers College, Columbia University. New York, London and Bombay, Longmans, Green & Co. 1899.

The magnificent spectacle of German education is something which it is of extreme importance for our own progress, as well as of great interest as an intellectual phenomenon, that we should thoroughly understand. Nothing that has hitherto appeared on the subject is to be compared for comprehensiveness of character or for vividness of presentation with this work of the Dean of the Teachers College of New York. If all works on education were as interesting as this the science of pedagogy would not be the dreary burden which it is now to most persons of any spirit or of any feeling for logical structure. And if the science of pedagogy had more frequently proved attractive to the better order of writers, who knows how much farther advanced the art and practice of teaching might have been than it now is?

Mr. Russell has been European Commissioner of the Regents of the University of the State of New York, and special agent of the Bureau of Education for the study of German schools. He has thus had unusual opportunities for carrying out his investigations; school officials, high and low, have given him generously of their time, and have put him in the way of comprehending the spirit and the ideals of their educational system. The five years that he has devoted to the subject have been put to good use, and their product is a book of an unusual degree of value. We can only touch upon a few of the more striking characteristics of the German system of education as here depicted.

Of first importance, and far more striking than anything that is said in regard to the system of instruction, is the preparation to which the German teacher must be subjected before he can enter upon his career. It should be premised that there are no exceptions in Germany, and that these regulations must be complied with by absolutely every one who proposes to become a teacher in a higher school. After his nine years' course in a gymnasium the candidate for this profession enters the University, where his studies can nominally be completed in three years, but where, as matter of fact, he is sure to spend from four to five years of hard work. He then presents himself for the State examination, the sole test of a candidate's preparation for any professional career, which neither the degree of Doctor of Philosophy nor any other scholarly distinction can enable him to dispense with. The examining board (consisting chiefly of university professors) he must satisfy (1) of his proficiency in pedagogy and philosophy, including psychology, logic and ethics; (2) of his familiarity with the German language and literature; (3) of his acquaintance with the doctrines of religion, and (4) of his thorough knowledge of the special subjects which he expects to teach. These latter subjects must be at least four in number, two major and two minor, and he must never presume to teach any subject in which he has not received a certificate, nor to any extent beyond that corresponding to the grade of his certificate—first, second or third. (There are certain restrictions limiting his combination of subjects; for example, with any grade of French or English, he must have at least third grade Latin, and if one of his majors is religion the accompanying one must be Hebrew.) As a general thing, the future teacher does not take the degree of Ph. D. at his university; that is a luxury costing from one to two hundred dollars, besides the time spent in the preparation of a thesis; and the Staats-Examen is regarded as more of a distinction than that leading to the degree, besides being, in any case, obligatory. The application for examination is itself a serious affair. There is a fee of thirty marks to be paid for each examination; then there are certificates and testimonials to be furnished of the candidate's whole course of preparation, showing precisely what he has done and what his standing has been during his whole school life from the age of nine years; then there is