of the April meeting of the society, by F. N. Cole; report of the April meeting of the Chicago Section, by H. E. Slaught; In Memoriam Heinrich Maschke; "Criteria for the Irreducibility of a Reciprocal Equation," by L. E. Dickson; "A New Graphical Method for Quaternions," by J. B. Shaw; "Logic and the Continuum," by E. B. Wilson; Shorter Notices (Picard's "Développement de l'Analyse and La Science moderne," by E. B. Wilson; Mathew's "Algebraic Equations," by F. Cajori; Bertini's "Geometria Proiettiva degli Iperspazi," by C. H. Sisam; Staude's "Analytische Geometrie des Punktes, der geraden Linie und der Ebene," by G. N. Bauer; Shepard's "Strength of Materials," by E. W. Ponzer; Hering's "200-jähriges Jubiläum der Dampfmaschine," by F. Cajori); Notes; New Publications.

THE July number of the *Bulletin* (concluding volume 14) contains: "The Inverse of Meusnier's Theorem," by Edward Kasner; "On the Distance from a Point to a Surface," by Paul Saurel; "On the Solution of Algebraic Equations in Infinite Series," by P. A. Lambert; "The Deduction of the Electrostatic Equations by the Calculus of Variations," by A. C. Lunn; "The Fourth International Congress of Mathematicians," by C. L. E. Moore; Shorter Notices ("Encyklopädie der Elementar-Mathematik," Bande 2–3, by H. S. White; Lebesgue's "Leçons sur l'Intégration et la Recherche des Fonctions Primitives," by D. R. Curtiss); Notes; New Publications; Seventeenth Annual List of Papers read before the Society and subsequently published; Index of Volume.

AT the sitting of the Paris Academy of Sciences on June 22, according to a report, M. Poincaré read a note from M. Jean Becquerel on the nature of positive electricity and the existence of positive electrons which have been found in a Crookes tube. Dr. Salmon, of the Pasteur Institute, announced that sleeping sickness had been cured in monkeys by means of a form of atoxyl. MM. Beorges and Gustave Laudet gave particulars of their success in photographing sounds. Those photographs are so clear that they permit of a study of sound far more precise than any hitherto known. The most delicate peculiarities of the voice, such as lisping, and even breathing, are produced with the greatest distinctness. The MM. Laudet, who have been pursuing those inquiries since 1905, when they first communicated their ideas to the Academy of Sciences, have been induced to give the present account of their success owing to the recent communication on the same subject by M. Devaux Charbonnel. The MM. Laudet, instead of having recourse to electricity, like M. Devaux Charbonnel, have employed a purely mechanical and direct means for securing the desired record.

SPECIAL ARTICLES

OBSERVATIONS ON CHANGE OF SEX IN CARICA PAPAYA

WHILE change of sex among the phanerogams is not unknown yet it is of such rare occurrence that any well-demonstrated instances as those shown by the Caricas under observation are worthy of careful study. This is especially true when that change can be brought about by cultural methods as seems to be clearly proved in the present instance.

Carica papaya is a tropical, rapidly growing tree-like form belonging to the Passifloreæ family. As found in Porto Rico it is distinctively diœcious, the monœcious form being very rare except when produced as were the ones under observation. The tree is non-branching, but will readily develop lateral buds if the terminal bud is destroyed.

The staminate trees bear the flowers in dense, dichotomously branched head-like groups on a very long helicoid dichotomous branched peduncle. The flowers in each group on the peduncle develop successively, continuing over a long period of time, so that there is no time during the year when flowers are not shedding pollen. The pistillate tree bears axillary flowers of a very different form from the staminate. The pistillate flowers are born in an unbranched peduncle and vary in number from one to five or even more; usually three. Of these only one, with rare exceptions, sets fruit. It is said that the flowers

are sometimes perfect, but such have not come under my notice as yet.

The fruit varies in form from oval to a distinctively necked pear shape and in weight from three pounds to ten pounds or even more. The fruit in some varieties is very delicious and has many medicinal properties ascribed to it, so that the plant is of enough value economically aside from its botanical interest to be worthy of careful study.

The change of sex in the first tree noted was brought about accidentally. A staminate tree of some age had its terminal bud accidentally injured. The staminate flower clusters produced shortly afterwards contained pistillate flowers in the terminal group. These flowers set and developed good-sized fruits. When mature they had all the characteristics of normal fruits except that the fruits were not quite so well filled out, having a somewhat wrinkled appearance. The seeds are smaller than the normal seeds but seem to be normal in other respects. Time has not been sufficient to test their germinating power. The clusters later developing also contain pistillate flowers in the same position in the cluster as the first one, and now and then a cluster will contain two and even three of these fertile flowers, each one producing fruit.

On observing this peculiarity, investigations were begun to find the cause. Inquiry of the natives brought out the theory that the removal of the terminal bud in the new of the moon would usually cause this transformation. Other trees growing on the grounds were at once set aside for experimental purposes and the tops were removed at different phases of the moon to disprove the moon's having any effect and also to show, if possible, what were the necessary conditions, if any, outside of the mere removal of the terminal bud. Thus far it is clearly shown that the removal of the terminal bud does cause the change, but also that some other condition is necessary, as only a part of those thus treated have thus far developed any pistillate flowers. The moon's phase does not appear to have any control, though, strange to say, those treated at a fairly definitely recurring period are the ones that show change. It is possible that the plant has definite short cyclic periods of growth and that it is necessary to remove the tip at some definite phase of this cycle in order to produce the development of fertile flowers. If this be true and this cycle should accidentally coincide fairly well with the moon's phases, the belief in moon influence would naturally arise.

This view of an approximately monthly periodic cycle of growth has several things to support it. The chief of these is found in the continuous development of flowers and fruit. At no time during the year were the trees under observation without both flower and fruit. On the other hand, there are times when growth is more rapid, more flowers are developed and the terminal nodes elongate much more rapidly. The exact time of these periods has not yet been determined definitely, but data is being collected.

The habit of the plant is being closely studied to determine the characteristics of each change and at what point in this growth the tips must be removed to produce the changes under discussion. It is possible that the power to produce pistillate flowers is inherent in the plant, being dormant unless some shock is given to destroy the equilibrium of the growth forces. This inherent quality is indicated by the fact that in some countries the plants are sometimes found naturally monœcious.[1]

It may also be that certain varieties are monœcious. That there are variations in the plants is true, as noted under forms of fruits, but thus far no variation has been observed that was definite enough or of well enough fixed characters to warrant a well-defined division into varieties.

I recognize that as yet but little has been definitely settled and that the questions involved open up a wide field for investigation, but I present the facts, thinking they will be of interest and hoping that any discussion caused by them will bring out points that will aid in future investigations.

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[1] "Dictionary of Economic Products of India," Watt, Vol. II.