water. The salt prevents the solution of the blood-globules and consequent diffusion of the red haemaglobin. J. AMORY JEFFRIES.

THE ORIGIN OF CULTIVATED PLANTS.

Origine des plantes cultivées, par ALPH. DE CANDOLLE. (*Bibliothèque sc. internat., tom. xliii.*) Paris: Baillière & Cie., 1883. 8vo.

IT is a common saying, that the plants with which man has most to do, and which have rendered him the greatest service, are those of which botanists know the least. That this should hold true of the plants of immemorial cultivation, as regards both their limitation in species and their sources, is not to be wondered at. The reason why many of these cannot be identified with wild originals is because, in all probability, the originals have long been extinct. Even when spontaneous examples have been found, it is sometimes far more probable that these are the offspring of the cultivated plant relapsed into wildness, than that they are vestiges of an original stock. Indeed, plants of comparatively recent acquisition to Europe are still puzzles; of not a few the question is still open whether they originated in the new or in the old world. The herbalists and ante-Linnean botanists gave little attention to the original sources of the plants they described, and Linné still less. Following erroneous indications, he assigned the common sunflower to Peru; and its relative, the tubers of which we call artichokes, to Brazil; when he might have known that they both were sent to Europe from Canada. It is only within the present century that any considerable attempts have been made to solve such problems. Robert Brown, Humboldt, and the elder De Candolle opened the way; and Alphonse De Candolle, who has particular aptitude for this class of investigations, is one of the few who have undertaken to discuss this subject systematically. Almost thirty years ago, in his Géographie botanique raisonée (2 vols. 8vo, 1855), just before the Darwinian deluge, which swept away some of the old landmarks, and changed the face of many things, De Candolle discussed in detail the changes which have taken place in the habitation of species, and has a long chapter on the geographical origin of cultivated plants. In this the then existing knowledge is well brought up to date, systematized, and critically treated.

This book is out of print. Greatly as it is needed, the author, who is older than he was, recoils before the labor of a new edition of the whole work. But he has taken up the subject of the origin of cultivated plants anew, and the present volume is the result.

The number of species of cultivated plants here passed in review seems at first sight to be wonderfully small, viz., only 247, or, reducing certain races to their supposed types, little over 240. But species cultivated for ornament and for medicine or for perfume are rigidly excluded; while, on the other hand, so insignificant a forage-plant as spurrey, so poor and weedy a pottage-plant as purslane, a plant which we know only in ornamental culture and for its medicinal product, castor-oil, and a fruit-tree of such slight pomological importance as the American persimmon, are included. The latter and its old-world analogue are, indeed, only enumerated; but no one cultivates persimmons in this country. It is said that no plant of established field-culture has ever gone out of cultivation, at least in modern times, except perhaps woad; but, thanks to the chemists, madder is doomed already, and indigo is to follow.

Although Humboldt could affirm, so late as in the year 1807, that the original country of the vegetables most useful to man remains an impenetrable secret, so great progress seems to have been since made that De Candolle is able to assort his 247 species into 199 furnished by the old world, 45 by America, and only three which are still doubtful in this regard. Here the chestnut, the red currant, the common mushroom, and the strawberry are counted as of European, properly enough; since they were first cultivated in the old world, although indigenous to North America as well. The latter country makes a poor show indeed, when it is said that its only indigenous nutritive plants worth cultivating are the sunflower-artichoke and a pumpkin, though Indian rice (Zizania) might have been turned to account if it were not for the true rice. We are not so clear as to any original inferiority, nor that these numbers might not have been more nearly equal if civilization had begun as early in the new as in the old world. Europe had the great advantage of lying adjacent to two other continents, and of being colonized from them by races which were already agricultural.

As respects the three plants of doubtful country, two are species of Cucurbita (moschata and ficifolia), comparatively unimportant and little known, which have reached Europe only recently, the latter within thirty or forty years; and the third is Phaseolus vulgaris, the bean of the Americans, whose right to it we propose to claim. And we would suggest that

its place in the list should be taken by the cocoanut, the only esculent species common to the two worlds within the tropics which we have reason to suppose was carried or drifted across the Pacific in prehistoric times. Being a littoral tree, with fruit capable of enduring long exposure to salt water, its dispersion is not so surprising. The question is, in which direction the dispersion was effected; and that perhaps can never be determined. In his general list De Candolle includes the Cocos nucifera among the plants of old-world origin, with queries whether of the Indian archipelago, or of Polynesia. In his former treatise he inclined to the theory of a transmission westward from the Pacific coast of Central America: in the body of the present work, after full statements *pro* and *con*, he is disposed to reverse his former opinion. But, as the dispersion may have been mainly by natural agencies, the question may be relegated to another class of inquiries. The presumption arising from the fact that all other species of Cocos are American, may be offset by the asserted fact that, although the tree formed forests on the islands off Panama when these were first visited by Europeans, it would appear to have only recently reached the West Indies and the adjacent main. So useful a tree, if indigenous to one side of the isthmus, would have been transported to the other and to the islands beyond by the very earliest races of men. As to oceanic transport, judging from the charts, the drifting of cocoanuts from America to Polynesia by the great current south of the equator seems hardly more or less likely than the reverse by the return equatorial current north of it.

It would be well to give some account of our author's method of investigation and exposition, of the kinds of evidence which are brought to bear upon the questions discussed, botanical, paleontological and archeological, historical and linguistic, each bringing some light of its own sort, and in their coincidence giving all the assurance of which such inquiries admit. It would be interesting to show, moreover, that although in most cases the continent or even the country from which each plant came to Europe, or in which it has been immemorially cultivated, has been fairly well ascertained, their origin or parentage has not. Only one-third of them are really known to botanists in a natural or wild state; and from this number subtraction may be made of such as have been detected only once or twice, and which may merely have run wild: the common tobacco-plant of the new world, and the bean of the old, are in this category. On the other hand, there are several which botanists confidently trace to indigenous originals from which the cultivated plant has undergone considerable alteration: of such are the olive, the vine of the old world, flax, and the garden poppy; and in America, the potato, the sunflower-artichoke, and the tomato. But we know not, and we probably shall never discover, the particular source or origin of the cereal grains of the old world, and of maize in the new; of sorghum and sugar-cane; of the pea, lentil, chick-pea, and peanut, and of the common white bean; of sweet-potato and yams; and nearly the same may be said of the peach, oranges and lemons, and of all squashes and pumpkins.

But we must conclude our brief review with a note upon two or three plants, the early history of which concerns our own country.

Phaseolus vulgaris, our common bean,[1] ranks in De Candolle's table as one of the three esculent plants, the home of which, even as to continent, is completely unknown. Linné credited it to India, as he did our Lima bean also; but he took no pains to investigate such questions. This has been so generally followed in the books, that even the Flora of British India in 1879 admits the species, adding that it is not anywhere clearly known as a wild plant. But Alph. De Candolle, in his former work, had discarded this view, on the ground that it had no Sanscrit name, and that there was no evidence of its early cultivation in India or farther East. Adhering, however, to the idea that our plant was the Dolichos and the Phaseolus or Phaselos of the Greeks, and of the Romans in the time of the Empire, he conjectured that its probable home was in some part of north-western Asia. But recently, as "no one would have dreamed of looking for its origin in the new world," he was greatly surprised when its fruits and seeds were found to abound in the tombs of the old Peruvians at Ancon, accompanied by many other grains or vegetable products, every one of them exclusively American. In his present very careful article he admits that we cannot be sure that it was known in Europe before the discovery of America, and that directly afterwards many varieties of it appeared all at once in the gardens, and the authors of the time began to speak of them; that most of the related species of the genus belong to South America, where, moreover, many sorts of beans were in cultivation before the

[1] Bean in Great Britain is Faba (the fève of the French), and the varieties of Phaseolus are called French beans.

coming of the Spaniards: and the idea that it might have been native to both hemispheres is discarded as altogether improbable. Upon this showing, it would appear that the plant should have been set down as of American, rather than of wholly unknown, origin. Indeed, when all the evidence is brought out, the discovery of these beans in the Ancon tombs need excite no more surprise than that of the maize which accompanied them.

For maize, beans, and pumpkins were cultivated together, immemorially, all the way from the Isthmus to Canada. And, although some of the sorts of beans mentioned by Oviedo in 1526, as raised in great abundance in Nicaragua where they are native, and also of those everywhere met with by De Soto (1539–42) in his march from Tampa Bay in Florida to the Mississippi, doubtless belonged to Phaseolus lunatus, yet most if not all of those which at the same early period Jacques Cartier found cultivated by the Indians of Canada, must have belonged to Phaseolus vulgaris, or its dwarf variety P. nanus; for only these are well adapted to the climate of Canada especially the low and precocious variety, which alone has time to mature between the spring and the autumn frosts. Indeed those same beans, derived from the Indians along with maize and pumpkins, have doubtless continued here in New England in direct descent, to form that staple diet for which the northern part of the coast of Massachusetts has long been famous; so that when Rufus Choate, defending a ship-captain against a charge of ill-treatment in having fed his crew exclusively upon it, rehearsed, in his accustomed affluence of language, the praises of "that excellent esculent and superlatively succulent vegetable, the bean," he was celebrating the good qualities of a distinctively and aboriginally American article of food.

We are not to suppose, however, that this species had its home in North America, at least north of Mexico. The same may be said of our squashes and pumpkin, for which similar reclamation may be attempted upon another occasion.

The cultivators of more than one department of science have reason to thank our author for having returned in mature age to the studies of a third of a century ago, and to admire the thoroughness, patience, sound judgment, affluence of knowledge, and felicity of exposition, which characterize this, as indeed they do all his writings. We are well pleased that the first number of our new journal should introduce to the American public an important contribution to science by De Candolle. Asa Gray.

NATURAL HISTORY OF MINNESOTA.

The geological and natural-history survey of Minnesota. The tenth annual report for the year 1881. N. H. Winchell, State geologist. St. Paul: 1882. 254 p., 14 pl. 8vo.

The principal part of this volume consists in the Preliminary list of rocks and Typical thin sections of the rocks of the cupriferous series in Minnesota, articles which appear to be the result of the penurious way in which Minnesota, in common with many other states, deals with her geological survey, compelling the state geologist to do work that ought to be done only by competent skilled lithologists. The results in this case, as elsewhere under similar circumstances in our country, are the same as they would be with paleontology, were the average state geologist compelled to work up all the fossils of his survey. Good lithological work requires something more than a microscope, a few thin sections, and a fair knowledge of minerals.

The convenient summary of opinions which have been held of certain rocks in the Lake-Superior region given on pp. 123–126 appears to be a digest of the more elaborate statements made in Dr. Wadsworth's notes on the geology of this district (Bull. mus. comp. zoöl., vii. No. 1), with additions of a later date, although no credit is given to that writer; on another page of Science, Mr. Selwyn takes exceptions to the views accredited to him, though Mr. Winchell would seem at first sight to be warranted in his statements from Mr. Selwyn's Canadian report of 1877–78, pp. 9 A, 14 A. The execution of the three maps accompanying the Minnesota report is to be praised.

In the zoölogical section of the report, Mr. C. L. Herrick presents a second contribution to a knowledge of the fresh-water Crustacea of the state. In this, as in his first paper (Seventh report, 1878), he limits himself almost entirely to the microscopic Entomostraca. These two papers, with Birge's Notes on Cladocera (of Cambridge, Mass., and Madison, Wisc.), comprise about all the systematic work on these animals done in this country. There is as yet, then, no basis for a discussion of their geographical distribution. According to Mr. Herrick, sixteen out of the thirty-three species described are also European. Thirteen species are new, and two new genera are established. Looking over