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INDIAN CORN,

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BY

E. LEWIS STURTEVANT, M. D.,

SOUTH FRAMINGHAM, MASS.

[Reprinted from the Thirty-eighth Annual Report of the New York State Agricultural Society, 1878.]

ALBANY:
CHARLES VAN BENTHUYSEN & SONS.
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INDIAN CORN,

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E. LEWIS STURTEVANT, M. D.,

SOUTH FRAMINGHAM, MASS.

[Paper presented by request at the Annual Meeting, January 22, 1879.]

The interest which surrounds an investigation into the history of a cultivated plant, increases with the importance of the uses to which the vegetable is applied, and the obscurity which prevails over the origin. There is a delight in probing within mysteries, and in the following out of clues which trace to mythology and the beginnings of things, especially when the value of the production lends a factitious dignity to everything connected with the investigation, and the fancy can play without the appearance of triviality, or the accusation of idle research. The corn plant eminently holds this relation to the student, as furnishing support to so many people of diverse nationalities, being cultivated in nearly every region of the globe, and furnishing to commerce such an important increment. In the year 1877, the product of Indian corn is given for the United States alone as 1,342,588,000 bushels, representing a value of \$480,643,400. To move this crop at one time would require 3,759,162 cars, which would occupy at least 30,000 miles of track. As an actual fact, of this immense crop, 70,860,983 bushels were exported, constituting a greater value than any other one exported product save cotton and bacon alone.

BOTANY.

Indian Corn, the *Zea Mays* of botanists, is an annual plant of the order of grasses, characterized by its monœcious flowers, the male borne in a terminal panicle; the spikelet two flowered. The female flowers are

borne in an axillary spike, and are enveloped in a number of leaf sheaths which answer to floral envelopes. There are very many, in fact, innumerable varieties, caused by climate, selection, cross-fertilization and cultivation. The plant may vary in its varieties, under certain conditions, from two feet to fourteen feet or more in height; it may contain a different number of nodes; it may normally develop ears from different nodes in different varieties; it is subject to variation, between varieties, of leaf, size and number; some are more prolific than others; the maturity of varieties may vary from ninety to one hundred and twenty days, etc. We also find variations in the characters of the seed and ear. Some bear short, others long ears; some ovoid, others tapering ears; some eight-rowed, others ten, twelve, sixteen, twenty, and even up to twenty-four and thirty-six rowed ears; some of the kernels are globular, others ovoid, others cone-shaped, some broader than long, others longer than broad, some narrow, others deep; these kernels may be flattened, pointed, toothed, indented, wrinkled or smooth. In color of kernel we have variations from pearl white, white, dusky, pale yellow, yellow, orange, copper-colored, red, purple, slate, black, and even variegated. In size one variety may produce a grain seven or eight times heavier than that from another variety. In the arrangement of the structural portions of the kernel, we find variations from the pop-corn at one extreme, wherein the oil is visibly distributed throughout the whole mass, through varieties wherein there is visible starchy matter between the chit and the common oily portion, to kernels wherein there is no appearance of oil. We find the grain of some varieties hard, of others softer; in still others a granular structure, and in sweet corn nearly gummy as taken from the plant at time of harvest, etc. And these and many other distinctions are characteristic of varieties, and are in the main transmitted with considerable constancy through the seed.

Within a variety we notice a facility of sporting which is remarkable. Through the influence of foreign pollen, the cob may bear kernels having every appearance of the variety which furnishes the pollen, as well as other kernels of intermediate color, shape and qualities. Grain may be borne on the tassel or staminiferous plume, and the stamens may appear on the cob, or the plume may be converted into an ear, and the ear into a tassel, although usually the two characters are combined in these cases. The plant may vary in its habit of growth, and become what is called branched; the ear may develop at nodes where it does not normally belong; the nodes, from which normally but a single ear proceeds, may bear two ears, or even in two cases we have observed, four ears have appeared at the upper node, which is normally barren of fruit; the cobs may produce a tassel of staminiferous bloom from their apex, the grain being found as usual in the basal portion; the ears may branch at their base, forming two, three, or even six ears; the branches may produce a terminal ear, and at the same time develop ears from their nodes, as we have in our collection three nodal and one terminal ear on a branch. The kernel also is subject to change of shape, and to change of structure. We have observed flint varieties rounded and dented, both kinds in the same cob, and produced without any apparent aid from cross-fertilization from a dent variety (1).

(1) We mention, as a matter of interest, that in one variety, at least, wherein the spikelet on the panicle bears one pedicled and one sessile flower, it has always, within our observation, been the sessile flower which has sported into a grain-producing organ, while the pedicled

BIBLIOGRAPHY.

The only books or essays on corn we have met with, or seen mentioned, worthy of record, are included in the list as given below. We here mention that, in our references to authorities in other than the English or French languages, we have been compelled to trust to others, but in every case material is furnished by whose aid can be readily seen who is to vouch for the authorities:

- An Essay on Indian Corn. By P. A. Browne, 8°, Phila., 1837.
 Memoir on Indian Corn. By D. J. Browne, New York, 1856.
 Treatise on Indian Corn. By Edward Enfield, 12°, New York, 1866.
 Essays. P. A. Browne. Farmer's Cabinet, 1837.
 D. J. Browne. Trans. of Am. Institute, 1846.
 H. Carl Heller. U. S. Pat. of Rept., 1847.
 J. H. Salisbury. Trans. N. Y. Agr. Soc., 1848.
 C. L. Flint. ib. 1849.
 C. N. Bement. ib. 1853.
 F. Brendel. Trans. Ill. State Agr. Soc., 1856-7.
 J. H. Klippart. Agr. of O., 1858.
 C. L. Flint. Agr. of Mass., 1858.
 W. C. Flagg. Trans. Dept. of Agr. of Ill., 1872.

Facts for Farmers. Maize, its Culture and Uses. London.

Cobbett, Wm. A Treatise on Indian Corn, 12°, London, 1828.

Darwin, Charles. Animals and Plants under Domestication, chap. ix.

Amoureux. Mémoire sur le maïs, 1784.

Parmentier. A work on maize, 1785.

Duchesne, E. A. Traite du maïs, 8°, Paris, 1833.

Bonafous. Nat. Hist. du maïs, folio, Turin and Paris, 1836.

Burger. Natural History and Culture, 1809.

Metzger. Die Getreidearten.

Harasti. A Practical Treatise on the Culture of Maize, 1788.

See, also, the following references in addition to those others that will occur in our text:

- Alph. de Candolle. Geograph. Bot., p. 942; Silliman's Journal, vol. xiv; Teschemacher in Proc., Bost. Soc. Nat. Hist., Oct. 19, 1842; Godron, de l'Espece, tom. ii; Scott, J., Trans. Bot. Soc. of Edinb.; P. Kalm, Swedish acts, vol. iv, etc.

SYNONYMS.

As a matter of course, Indian corn has received various names in the different countries where it has been cultivated. We have collected the following:

| | |
|----------------|-------------------------------------------------|
| Abyssinia..... | Mashela bah-ry, Millet from the sea, (Parkyns). |
| Aztec..... | Thaolli (Humboldt). |
| Belgian..... | { Mays, } (Salisbury). |
| | { Turksch koorn, } |

flower has resisted the change. When the plume is all ovary producing, then there have been no pedicelled flowers. In those cases of the stamiferous flower occurring in the cob, it has always been the normally undeveloped or abortive flower which has produced stamens. This fact would suggest an affinity with the sorghums, sufficient at least to warrant the hypothesis (supported as well by other facts of observation) that the maize and sorghum have been derived from one parent species, in the distant past, and that the sorghums of Africa and the Zea of America are but the same plant as changed by a different line of evolution. This bearing of grain in the tassel is certainly hereditary, and, in the fields we have studied, is accompanied by correlative barrenness at the nodes, or a tendency thereto, etc. This, be it understood, is not advanced as a theory, but as a hypothesis, which tends to clear up certain obscurities.

| | |
|---------------------------|------------------------------------------------------|
| Burmah | Pyoung-boo, (Mason). |
| Brazil | Milho, (Treas. of Bot.). |
| | Maiz, (Niewhoff, 1647). |
| China | La-chou-cha, (Flint). |
| | Yii-shu-shu, (Bretschneider). |
| Ceylon..... | Muwa, (Moon). |
| Dardanelles..... | Reed wheat, (Forskal). |
| East Indian archipelago.. | Jagung, or "Indigenous," (Crawford). |
| Egypt..... | Dourah of Syria, (Klippart). |
| | Doura shammy, Syria Millet, (Parkyns). |
| English..... | Maize, |
| | Indian corn. |
| France | Le mais, |
| | Blè de Turquie, } (Loudon). |
| " | Blè de Espagne, } (Salisbury). |
| | Blè de Indie, } |
| " | Wheat of Rome, in Lorraine and Vosges, } (Klippart). |
| | Wheat of Guinea, } in Provence. |
| | Wheat of Barbary, } |
| Germany | Der Mays, (Loudon). |
| | Turkischer koorn, (Salisbury). |
| Greece, Athens | Arabian corn, (Sibthorp). |
| Haytian | Mahiz, (Gomara). |
| Hindustan | Muk Jawarree-boola, (Graham). |
| India..... | Makkai, (Dutt). |
| | Moka, (Treas. of Bot.). |
| Indian { | Lenchesquem, (D. J. Browne). |
| { Lenni Lenapi ... | Wiachin, (Winthrop). |
| { Quonnectiquot .. | Mayze, (Flint). |
| { Coosaws | Eat chumnis, (Wood). |
| { New England... | Gran Turco, (Loudon). |
| Italy | Grano d' India, } (Salisbury). |
| | Grano Sicilano, } |
| Japan | Nanbamthbi, (Heller). |
| | Sjo Kuso, (Kaempfer). |
| | Too Kibbi, (Thunberg). |
| Malays | Jagong, (Treas. of Bot.). |
| Mexico | Mayz, (Inca Garcilasso de la Vega). |
| | Centli, (Flint). |
| | Tluolli, (Clavigero). |
| Peru . { | Cara, |
| { one variety | Muruchu, } (Flint). |
| { another variety.. | Capia, |
| Pekin, China..... | Yii-mi, Jade corn, (Bretschneider). |
| Persia | Ghendum i Mekka, wheat from Mecca, (Bretschneider). |
| Portugal | Milho da India, } (Salisbury). |
| | Milho grande, } |
| Quichua | Cara, (Flint). |
| Russia..... | Tureskorichljeb, (Salisbury). |
| Sennaar | Eysh reef, Egyptian Millet, (Parkyns). |
| Sicily | Il grano d' India, } (Hogg). |
| | O gran Turcu, } |
| | Maiz, (Loudon). |
| Spain | Trigo de Turkuia, (Flint). |
| | Zara, (Treas. of Bot.). |
| Sweden..... | Turkish hvede, } (Salisbury). |
| | Korn, |
| Turkey..... | Misrbogdag, or wheat of Egypt, (Klippart). |
| West Indies | Morochi, a variety, (Acosti). |
| | Mahiz, (Colombo). |

I. AMERICAN HISTORY.

ANTIQUITY OF ITS CULTURE.

The mere fact of the great variability of the corn-plant, and its pliancy of habit which has given it an adaptiveness to so many regions of varying climate, is sufficient evidence of the antiquity of its culture; and, we might add, that it is uncertain whether any truly wild variety is known to exist, as, to say the least, there seems no evidence that the so-called wild varieties are other than cultivated varieties escaped from cultivation. A peculiar kind, in which each grain, instead of being naked, is concealed by a husk, has been stated, on insufficient evidence, as Darwin(2) observes, to grow wild in Brazil; but Professor Gray states that this species produces from its seeds either the common or the husked maize. A cut of the so-called wild corn, said to be found growing "in the Rocky Mountains of North America, and down to the humid forests of Paraguay," is to be found in the United States Patent Office Report for 1853 (page 98), and another cut, evidently of a different variety, under the name of Oregon, California, or wild corn, said to have been introduced from Oregon, California, Mexico and South America, is given in Agriculture of Ohio, 1858 (page 524), and these cuts would seem to indicate a variability scarcely consistent with the claim of a species for the two.

When the fact is taken into consideration, that those plants which are the most sportive in cultivation are apt to be those whose origin is known to extend to a very remote antiquity, and which have become fitted through their adaptiveness of character to conditions of culture in regions far apart and dissimilar in climate, we are prepared to grant that the probabilities of corn being a most anciently cultivated plant are very strong, and we, for our part, should not anticipate the corn-plant ever being found truly wild, as we must believe that it has been modified so greatly from its original source as not to secure usual recognition. Indeed, we know from our own experiments, that the removal of a corn-plant from the normal conditions by mechanical cultivation about the growing plant alone, increases the tendency of the plant to vary, and is productive even in one generation, of a manifest departure from the type of the variety planted; and we believe we have noticed indications of changes which would lead to the inference that by a systematic planting of seed selected for its pure quality, a few generations of culture would secure differences as great as now exist between the so-called wild corn and the cultivated varieties.

Be this as it may, we have absolute evidence of the culture of corn in America extending beyond the historical period, in the charred corn-cobs, which have been taken from Indian mounds;(3) in the corn itself, two varieties of which were taken from tombs in Peru, apparently prior to the dynasty of the Incas,(4) while Darwin(5) relates that in the

(2) Darwin An. and Pl., under Domes, N. Y., 1868, i. 386.

(3) U. S. Dept. Ag. Rept., 1870, p. 420.

(4) Tschudi. Travels in Peru. Eng. Trans., p. 177.

(5) Voyage of a Naturalist. Harper's ed., 1859, ii, p. 117.

northern part of Chili, within the Cordilleras, heads of Indian corn are not unfrequently upturned in digging among the ruins of the old Indian houses in places where the modern inhabitants do not abide; still more emphatic is the evidence of antiquity in the finding of the head of a stalk of Indian corn identical in appearance with similar relics taken from out of the Huacas or old Peruvian tombs, *embedded* amidst the shells and much-drifted sea-rubbish on a terrace eighty-five feet above the sea,(6) occurring with bits of cotton thread and plaited rush. Were further evidence required, it may be found in an ear of corn(7) in the possession of the Smithsonian Institution, found deposited in an earthen vessel eleven feet under ground, in a grave with a mummy, near Arequipa, in Peru.

A most striking observation in regard to this last-mentioned ear of corn is that the grain is irregularly disposed on the cob in thirteen rows, suggesting the thought that at this early period the habit of the corn-plant in bearing rows in a number always divisible by two, had not as yet become so strongly fixed as at present.(8) We would also impress attention to the circumstance that two varieties are mentioned as being found by Tschudi. Gonçalo Ximenez, in describing the corn of New Granada, speaks of two varieties, a coarse and a fine, the latter called *morochó*. Jos. de Acosti, in his natural history of the West Indies, says, there are two sorts, one large and substantial, the other small and dry, which they call *morochi*. The Inca Garcilasso de la Vega, in treating of the products of Peru, mentions two sorts, one called *moruchu*, which is hard, and the other *capia*, which is tender and fine. Clavigero, in describing the grains of Mexico, says the Indians had several varieties, the large and the small sorts, the white, the yellow, the blue and the black. The corn at present cultivated about the Pueblas of New Mexico and Arizona, now as formerly, varies in color through shades of pink, blue and white. In his account of the Indians given to the Royal Society, of which he was a member, Mr. Winthrop says the corn is of various colors, such as red, white, yellow, blue, olive, greenish-black, speckled, striped, sometimes in the same field and in the same ear; Higginson, in New England's Plantation, says also of corn, that there are of "varietie of colours—as red, blew and yellow, etc." Josselyn also says, "Indian wheat, of which there is three sorts—yellow, red and blew. The blew is commonly ripe before the other" (Rareties, p. 83); and this for the Indians of the Northeastern America. A distinct variety noted for its earliness was cultivated by the Mandans of the northwest; other and distinct varieties by the Indians of New York, and the Carolinas, etc.

According to Flint,(9) at the old ruins of Copan and Central America, are found paintings and statuary ornaments of maize and De Candolle, also states that a variety of maize has been found on an ancient Peruvian

(6) Darwin, *ib. ii*, p. 135.

(7) U. S. Dept. Ag. Rept., 1870, p. 420, where it is frequent. See, also, Lapham's Antiquities of Wisconsin, for reason to think corn was cultivated by a race preceding the Indians.

(8) We examined an ear of mummy corn, December, 1878, which was in the possession of Professor Goodale, of Harvard University. The grains were irregularly arranged upon the cob, somewhat spirally, and of uncertain count. We made fifteen, fifteen and seventeen rows (odd numbers, observe) in three different counts on different segments of the ear, but on account of the irregular arrangement, we could not convince ourselves whether this was an actual or but a seeming fact. The kernel differed in shape from our common varieties no more than our varieties differ among themselves.

(9) Agr. Of. Mass., 1858, p. 52.

sculpture. Less certain evidence is in the stone pestles, which are dug up from Indian haunts, and from the mound regions of the west.(10)

When the early voyagers reached the shores of America, they found the corn-plant widely distributed, and under cultivation by the aborigines, who, indeed, gave lessons for its growing to the European colonists.(11) Columbus found it on the Island of Cuba and other points; Vasco Nunez, in Guiana; Navarez and De Soto, in Florida; and Gonçalo Ximenez, in New Granada, the latter of whom says that it furnished the principal food of the inhabitants, and bore very large and weighty spikes or ears, each generally yielding 700 grains, a bushel of which, when planted in warm moist land, frequently produced 300 fold;(12) others of the earlier historians and writers, as P. Martyr,(13) Ercilla, (14) Jean de Levy, (15) and Torquemada,(16) tell us that the first Europeans who set foot on the New World saw the maize. Bernal Diaz,(17) the author of "Conquest of Mexico" says "the country produces maize, red pepper, and many other things." Garcilasso de la Vega, one of the earliest Peruvian historians says, that the palace gardens of the Incas were ornamented with maize in gold and silver, with all the grains, stalks, spikes and leaves, and in one instance we are told that there was in "the gardens of gold and silver," an entire corn-field of considerable size, representing the maize in its erect and natural shape.(18)

Our Puritan fathers found corn in abundance on the New England coast, wherever they landed (19). The Sieur de Champlain in navigating along the coast found cultivated corn-fields in 1605, at the mouth of the Kennebec river in Maine, at Cape Cod, and "much land well tilled in corn" farther south. When Cartier visited Hochelaga, near Montreal, in 1535, he found that town situated in the midst of extensive corn-fields (20). The Five Nations made planting of corn their business before the French arrived in Canada, in 1603 (21). At first the Swedish settlements at New Jersey and Pennsylvania were obliged to buy maize of the Indians for sowing and eating, as Kalm writes, and Indian corn was also found as a common food, when Europeans first landed at New York (20). It was cultivated in extensive fields there as well as inland, as the French army under Frontenac, in 1696, spent three days in August destroying the growing corn of the Onondagas (22). Corn was also found in cultivation by the Indians about James river in 1607, when the colonists sent over by the "London Company" took lessons from them of its culture, the first attempt by Europeans that we find recorded (23).

We have thus far referred to the periods since the discovery by Co-

(10) See Smith. Reports, Passim.

(11) U. S. Pat. Of. Rept. 1853, p. 98. Other authorities could be given.

(12) D. J. Browne, quoted Trans. N. Y. Ag. Soc. 1848, p. 681. See also, Alvar Nunez Cabeça de Vaca, Relation; Disc. and Conquest of Florida by De Soto; F. Colombo, in Hakluyt's Voyages, etc.

(13) De Orbe novo de decades, 1516, iii. (14) Alonso de Ercilla, Araucana, Madrid, 1577.

(15) Historia d'un voyage fait en la terre du Bresil, 1723.

(16) Della Monarquia Indiana, tom. i, 158. (17) Writing some fifty years after the Conquest.

(18) Prescott gives as authorities:

Garcilasso. Com. Real pl. 1. lib. 5. Cap. 26; Lib. 6, Cap. 2. Also Sarmiento, Relacion Ms. Cap. 24. Cieza de Leon, Cronica, Cap. 94.

(19) Morton New England's Memorials. Boston, 1826, 68. Gooken, Mass., Hist. Collections, chap. iii. See also Bradford Hist. Plym. Plant. 82, 100. Mourt's Relation; Wood, New Eng. Prospects; Roger Williams' Key, etc.

(20) John Delafield, Trans. N. Y. Ag. Soc. 1850, 586

(21) Colden's Hist. of the Five Nations, London. 1747.

(22) Doc. Hist. New York, i, 212.

(23) U. S. Pat. Of. Rept. 1854, 98. Jefferson's notes on Virginia. See for culture in Louisiana. Du Pratz's Hist. de la Louisiana; Paris. 1758, ii, 176. In Colorado's, Castaneda's Relations, (in 1540). Cabeça de Vega's Relation, 1528-1535 for Florida, Texas, etc. In New England, Young's Chronicles of the Pilgrims, 231.

lumbus, and to monumental records. We might increase our references quite readily, as we have by no means exhausted our material. More interesting and important however, are the pre-Columbian mention. Thus in 1002, Rafn, sailing from Greenland, westward, Thorwald, brother of Lief, reached the wintering place in Vinland. The following season, on an island far westward, "met with a wooden Kornhjalmr" (corn shed?), but saw no other signs of inhabitants (Pickering). In 1006, Karlsefne sent out two Scots people to explore on the coast of Massachusetts (?), when they returned they brought back a bunch of grapes and a new sown ear of wheat.(23') At Hop, supposed by Prof. Rafn to be in the vicinity of Taunton, Mass., "they found there upon the land self-sown fields of wheat, there, where the ground was low, but vines there where it rose somewhat."(23'') In or about A.D. 1250, in the reign of Nopaltzin, King of the Chichimecs, the culture of maize and the art of making bread, long neglected and in danger of being lost, was revived by a Toltec named Xiuhtlato (Humboldt. Atl. Pict.). As corroboratives to the Icelandic Sagas, we find Adam of Bremen, in the 11th century, citing corn as growing in America to perfection.(23''')

MYTHOLOGY.

Were we unacquainted with any of these facts, yet would we have evidence of its ancient cultivation, and a hold upon the American aborigines which it must have taken time to secure, in the sacred associations which were connected by them with it. Not only was it a sign in the calendar among the ancient Mexicans, and a holy ornament upon their graves (24), but they had a goddess who presided over this production, who was called To-na-cay-ohu-a which means "she who feeds us." To her they consecrated the first fruits of the earth as the heathens did to Ceres (25).

Other authors name the goddess Cinteute, and state that she derived her name from that of maize, "Cintli," and received the first offerings of the maize harvest (26). We also learn (27) that a tradition existed that when the beneficent god Quetzalcoatl, the god of the air, resided upon the earth, the land teemed with fruit and flowers, without the pains of culture, and that an ear of corn was as much as a man could carry.

The Peruvians, as well, introduced maize into their religious festivals. During the high feast *Capacraqui*, held in the first month, *Raymi*, agreeing with our December, no stranger was supposed to lodge in Cuzco, to which they again all assembled as soon as the festival was over, to receive cakes made of maize, etc. In the beginning of the month *Hatuncuzqui*, which corresponds to our May, the Peruvians gathered their maize, and kept the feast *Aymorai*. They returned home, singing from the fields, carrying with them a large heap of maize, which they called *Perua*, wrapping it up in rich garments. They continued these ceremonies for three nights, imploring the *Perua* to preserve their harvest of maize from any danger, etc.(28.) The corn-stalks with many

(23') *Voyages of the Northmen to America.* Prince Soc., Pub., p. 51.

(23'') *Ib.*, 54.

(23''') *In Copenhagen.* Nord. oldskr. Selsk. Antiq. Amer., 1847.

(24) H. Carl Heller U. S. Pat. Of. Rept. 1847, 411.

(25) Jos. de Acosta's Nat. Hist. of the West Indies, lib. 4, chap. 16, p. 236, quoted in Trans. N. Y. Agr. Soc. 1818, 682.

(26) J. Brenetel. Trans. Ill. Agr. Soc. 1856-7, 473.

(27) Prescott's Conquest of Mexico, i, 59.

(28) D. J. Browne, quoted in Trans. N. Y. Agr. Soc. 1818, 690.

ears or with double ears were considered by the ancient Peruvians as sacred things, but not as deities; they were called by the Indians *Huantazara* or *Aryhuazara*, because they danced with them the dance *Arihuay* when the corn was suspended by branches of willow; in the same way did they worship the ears, the grains of which were of various colors, or were arranged in rows united in the shape of a cone.(28')

The North American Indians have also their traditions concerning its origin, not unmixed with mythological interest. The Western Indians believe that on a certain occasion the Great Spirit descended to the earth in the form of a beautiful squaw, and that when she first touched the ground with her feet, there sprang up the Indian corn. Another tradition is that the first grain of corn was brought to them by a black bird. The most beautiful of them, however, is that of the Odjibwas, which, as given by Mr. Schoolcraft, deserves a full quotation:

"A young man went out into the woods to fast at the period of life when youth is exchanged for manhood. He built a lodge of boughs in a secluded place, and painted his face of a sombre hue. By day he amused himself in walking about, looking at the various shrubs and wild plants, and at night he lay down in his bower, which, being open, he could look up into the sky. He sought a gift from the Master of Life, and he hoped it would be something to benefit his race. On the third day he became too weak to leave the lodge, and, as he lay gazing upwards, he saw a spirit come down in the shape of a beautiful young man, dressed in green, and having green plumes on his head, who told him to arise and wrestle with him, as this was the only way in which he could obtain his wishes. He did so, and found his strength renewed by the effort. This visit and the trial of wrestling were repeated for four days, the youth feeling at each trial that, although his bodily strength declined, a moral and supernatural energy was imparted which promised him the final victory. On the sixth day his celestial visitor spoke to him. 'To-morrow,' said he, 'will be the seventh day of your fast, and the last time I shall wrestle with you. You will triumph over me and gain your wishes. As soon as you have thrown me down, strip off my clothes, and bury me in the spot, in soft, fresh earth. When you have done this, leave me, but come occasionally to visit the place to keep the weeds from growing. Once or twice cover me with fresh earth.' He then departed, but returned the next day, and, as he had predicted, was thrown down. The young man punctually obeyed his instructions in every particular, and soon had the pleasure of seeing the green plumes of his sky-visitor shooting up through the ground. He carefully weeded the earth and kept it fresh and soft, and in due time was gratified by beholding the matured plant bending with its yellow fruit, and gracefully waving its green leaves and yellow tassels in the wind. He then invited his parents to the spot, to behold the new plant. 'It is mondamín,' replied his father, 'it is the spirit grain.' They immediately prepared a feast, and invited their friends to partake of it, and this is the origin of Indian corn."(29) In speaking of the Indians of New England, Roger Williams writes that they have a tradition "that the crow brought them at first an Indian grain of corn in one eare, and an Indian or French beane in another, from the great God Kautantouwits field in the southwest, from whence they hold, came all their corne and beanes."(29')

(28') *Rivers and Tschudi, Peruvian Antiq.*, 172.

(29) See Longfellow's beautiful versification of this story in "Hiawatha," Canto V, entitled, *Hiawatha's Fasting*. Read, also, in continuance Canto XIII, *Blessing the Corn Fields*.

(29') *Key to the Language of Am.*, Lond., 1615. *Narragansett Club Ed.*, p. 144.

II. EUROPEAN HISTORY.

There is a certain significance in language to trivial names, and hence it may not be out of place, in studying the European aspect of the history of corn, to see whether, in the popular terms, we cannot obtain a clue to the direction of its distribution. We must bear in mind the danger of this course leading us into error, if we ask more of it than this.

Notwithstanding Gerard, after describing in his "Herbal" several kinds of Turkey wheat, evidently varieties of maize, goes on to say that "these kinds of grain were first brought into Spain, and thence into the other provinces of Europe, not (as some suppose) out of Asia Minor, which is the Turks' dominions, but out of America and the islands adjoining, as out of Florida and Virginia, or Novembega," etc.; and notwithstanding M. E. Discourlitz says directly that maize was brought into Europe by the Spaniards from Peru, and Matthioli in 1645 affirms that Turkish wheat is not a proper name for maize, but that it should be called Indian wheat because it came from the West Indies, and not from Asia nor from Turkey; notwithstanding these and other statements to like effect, the Turkish possessions seem to have given name to maize in many different countries. Thus, the common name not only in Spain, but as well in Belgium, France, Germany, Greece, Italy, Russia, Sicily and Sweden, would indicate that it was received from the Turkish provinces; we would also infer that Italy received it from Sicily and American or West Indian derived seed as well; France from West Indian, Spanish, Italian and Northern African sources; Sicily from seed derived from America as well as Turkey; Central Africa from Egypt. Curiously enough, after this list, Turkey seems to refer back to Egypt for her supply; Egypt, according to Delile, has a tradition that the plant was received from the north by the way of Syria and Turkey, and Portugal alone of European countries would seem to have derived her seed from the West Indies in a manner which impressed the name of this locality as a proper one for distinguishing this cereal. From this list, the only certain conclusion that we can draw is, that Indian corn reached Northern and Central Europe, perhaps Southern Europe, through the countries bordering on the Mediterranean, but not probably from any one distinct center for this distribution; but whether these centers were Spain, or Asia Minor, or Africa, this method of investigation does not seem sufficient to furnish intelligible answer. Let us not fail to remember, however, that all times are not equally propitious for the dispersion of seeds or commodities; that some periods of the world's history are distinguished by conservatism and seclusion, are ages wherein social and physical barriers are everywhere to be found to hinder expansion, and intercommunication between adjoining districts, even if by chance a local activity should develop; that there are other ages in which every nation seems brimming with that activity which leads to adventurous schemes, and which tends to distribute useful products over wide regions. Hence such a useful cereal as corn might for a considerable space be confined for its knowledge and culture within a determinate locality, from whence under propitious circumstances, it might spread with a rapidity which history cannot follow. We see illustration of a parallel nature in the history of vegetables and fruit, which, although cultivated for long periods in certain portions of the world, are unknown in other neighboring regions until an Alexander, or some other less famous man, alike the product of a local activity and aggressiveness, breaks down barriers and carries his own restlessness to act as a leaven throughout

adjoining regions. We see in the great wars of Greece and Persia, and in the Crusades, a means for civilization which acted to equalize the possessions of distant countries, and to convey between divers people a knowledge of foods and luxuries before unknown. As a conception merely, it is no more difficult to suppose that corn could have been confined in its culture to some local point in Asia or Africa, and that its dissemination should have been delayed for years or for centuries, than to suppose that the peach could have existed in Persia for an unknown period, without having passed into Europe, or that the cherry should have awaited the coming of a Lucullus before it left Pontus for Italy; or to come to the present time, that mustard cress which occupies such a position in the London market, and which is so grateful to the English people, is not as yet classed among our market products. Difficult and easy to overcome, but who can foretell the habits, the tastes and the prejudices of a people, and hence, even, at the present day, the dissemination of new products for cultivation is considered the province of a government or of societies, so great the risk of failure and so small the chances for success. Had not circumstances given us the history of the potato, it might have logically been supposed to have existed for years, an obscure plant in gardens or fields, before its good qualities became recognized, and before it became distributed. Thus the potato is recorded to have been in cultivation in Peru in 1509,(30) and in the sixteenth century(31) was so common in Italy as to be fed to animals, yet it was introduced into German cultivation really only in 1650, did not get a hold in the field culture of England until 1684, and did not reach Scotland, where it is now so extensively grown, until the year 1728.(32) We cannot hence logically claim that corn must have been immediately adopted into cultivation upon its discovery, and we must not accept the argument for its novelty, in its rapid extension during those years of activity, both national and individual, which coincide with and followed after the discovery of America by Columbus.(32)

It would be curious, indeed, if the voyages of the old Northmen, which are now known to have extended to America, should have brought back samples of a grain which, unsuited to their climate, could scarcely have been preserved, and yet which might have secured a foothold in some favored locality bordering on the Mediterranean, and which only secured dissemination through the activity of communication, and revival of enterprise, which followed upon the discovery of the New World, when the minds of mankind were ripe for whatever was novel, and when old prejudices were being actively exchanged for new ones. We find Adam of Bremen, in the eleventh century, and L'ef, in 1006, reaffirms this fact, citing corn growing in America to perfection,(33) and this was during the period of the surprising activity of the northern nations, whose people, as pirates or adventurers, had frequent communication with the Mediterranean coast, and when the Varangians held the keys for the Greek emperors at Constantinople, while others of these corsairs pressed forward into the west.

(30) Acosta. Nat. and Moral Hist. of the Indies. Seville, 1509.

(31) Bowles. Nat. Hist. of Spain.

(32) M. Drouhyn de Lühys. Address before the Society of Acclimatization. 1867.

(33) For the necessity of these illustrations and observations, we can refer, among others, to Prescott, who in his "Conquest of Peru," writes: "The misnomer of Blé de Turquie shows the popular errors. Yet the rapidity of its diffusion through Europe and Asia, after the discovery of America, is of itself sufficient to show that it could not have been indigenous to the Old World, and have so long remained generally unknown to them."

(33) Littell's Living Age, Dec. 10, 1873, p. 764; Voyages of the Northmen, Prince Soc. Pub.

Let us here collect the evidence which has been presented, as seeming to imply that Indian corn was known to the Old World prior to the voyages of Columbus.

An old map, called the Chart of Incisa, of the thirteenth century, describes a grain of a golden color, and partly white, under the name of *meliga*; and Crescenzo, a century before Columbus, describes the method of cultivating this grain, which is very nearly the same as that of cultivating maize at the present day. On the authority of this map, many authors affirm that it came from the east, such as Sismondi,(34) M. Michaud,(35), Gregory,(36) Lonicer,(37) Amoreux,(38) Reynier,(39) and Daru.(40) A Portuguese writer, Sata Roza de Viterbo,(41) infers from a deed of the year 1289, that maize was known in Portugal. The deed read as follows: "Bequeathed to Stevan John of Perafitia, or to his heirs, one quarter of milhom." Crusaders are said to have brought, in 1204, from Asia Minor to Italy, a purse full of grains of a golden color, and partially white, which they called *meliga*, as we learn from the Chart of Incisa: now Cardan,(42) in the sixteenth century, says that the wheat cultivated in America, called maize, resembles in habit the plant called, in Italy, melica or sorghum; and George de Turre, 1685, says that the maize, or Turkish wheat, imported since a few years in Italy, has a stalk resembling that of the *meliga*, or sorghum.(43) Bonafous informs us that, according to some Spanish authors, maize was brought into Spain by the Arabs. Bock, the first botanist who wrote of it forty years after the discovery of America, asserts that it came from Arabia.(44) Ruelius maintains the same opinion.(45) Fuchsius also declares that it came from Asia to Greece, thence to Germany.(46)

We thus find that the investigations of many writers are in accordance with what we might infer from the vernacular names applied to maize in the different countries. We also note that the date, 1204, is surprisingly close to that assigned to the restless activity of the Scandinavians. The Saga which furnishes a history of Northern Europe from about the time of the Christian Era to 1177, mentions Viking expeditions to all parts of the world, including the discovery of North America (47); in 986, the Northman Bjarni discovered the wooded portions of the American coast(48); in 1000, Erike wintered at Vinland, now supposed to have been in the vicinity of Rhode Island and Massachusetts; and, according to another Saga, Karlsefne's expedition to Vinland was in A. D. 1007. We also find evidence in a Runic inscription deciphered in Greenland, that communication with the American continent was continued till as late certainly as 1135. We have then for dates, the discovery and communications with the American coast from 986 A. D. to 1135 A. D., the presence of Northmen in Constantinople, in Russia and southern regions, and a spirit of enterprise pervading the sea and land from the

(34) Biographie Universelle. Tom. xxix, 542, note.

(35) Histoire des Croisades (4th ed., Paris, 1826), iii, 348-9.

(36) Annales de l'Agriculture Francais.

(37) Naturalis Historiæ Opus Novum. Frankfort, 1551.

(38) Memoir sur le Mais. 1784.

(39) Feuille d'Agriculture du Canton de Vaud, vii.

(40) Republic of Venice.

(41) See Valcarel. Agric. Gen. y gobierno de la casa del campo. Valencia, 1768.

(From 34 to 40, copied from Flint's Essay.)

(42) De Subtilitate, lib. xxi, p. 389. Basle, 1553.

(43) F. Brendel, Trans. Ill. Ag. Soc. 1856-7, p. 471.

(44) Bonafous Hist. Nat. du Mais, p. 11.

(45) De Natura Stirpium, lib. xi, c. xxix, p. 428 [1535].

(46) De Historia Stirpium, 1542, pp. 824, 825.

(48) Enc. Brit., 8th ed., xviii, 162.

(47) Enc. Brit., 8th ed., xix, 690.

Baltic to the Euxine for a few centuries preceding the Crusades (49), and the asserted introduction of *meliga* by Crusaders. These connections are not very close, nor are they sufficiently well defined to be claimed as history, but they seem suggestive in the face of the certain existence of corn growing throughout America, its non-existence, or non-extension rather, through Europe until the discovery of Columbus in 1492, and the asserted references to grain supposed to be corn, on insufficient evidence perhaps, but none of which precedes the voyages of the Northmen to America, and the known communication of the northern races with the inhabitants of the Mediterranean coasts.

We could, unquestionably, find other references to a grain supposed to be maize, but we will content ourselves with but two: De Herbelet (50), the well-known Orientalist, mentions a passage of Mirkond, a Persian historian, which might lead us to suppose that maize was known to the Old World before the sailing of Columbus. Klippart (51), however, says that this passage does not refer to maize. "It relates that Khozar, son of Japet, caused to be sown on Volga's banks (the region frequented by Northmen descendants, observe) some *kaveres*, a kind of corn, which the dictionaries render by millet, yellow millet, millet of Katay; and that Rous, Khozar's brother, caused to be cultivated on Volga's islands the *borgon*, which signifies, according to the same dictionaries, a kind of hollow tree from which flutes are made." The second author, who speaks decisively, is Rifaud, who, in his "Voyage en Egypt," etc., states that he found the "grains and ear of maize within the tomb of a mummy at Thebes, in 1819. M. Virey, however, in the Journal de Pharmacie, shows that this grain called maize by M. Rifaud, was the *sorghum bicolor*, which, according to Delile, is a native of Egypt." (52)

It is of interest to note that one of the German sailors of Karlsefue, the year after the voyage, returned to Pomerania, or the region thereabouts.

It does not seem proper to pass without notice the statement of Bonafous, that the Treatise of Natural History, by Li-chi-tchin, written towards the middle of the sixteenth century, marks the existence of the maize in China; yet the *fac simile* of the ear from which this opinion is derived, does not show conclusively to our mind that it was not intended for a millet, but that it rather was, although we confess to a difficulty to account for the lines of the picture which perhaps represent silks.

Very ill-grounded, also, seems the opinion of those who believe that they recognize maize in plants mentioned by Homer (53), as well as by Theophrastus (54), and those who lay stress upon the frequent allusions in the Bible to a product or plant translated corn (55).

Let us summarize the opinions of authorities, first as to its eastern origin: Bock, 1532; Ruellius, 1536; Fuchsius, 1542; Sismondi, Michaud, Gregory, Lonicer, 1551; Amoreux, Regnier, Viterbo (Valcarcel), Douicer, Taberna-montanus, Bonafous, St. John, George de Turre, Daru, De Herbelot, Klippart.

This is indeed a formidable list of learned men, and it therefore seems desirable to transcribe the definition of *meliga*; upon the interpretation of which many of the above writers have founded their opinion. Accord-

(49) Milman's Gibbons' Rome, Boston, 1850, v. 422-425.

(50) Bibliotheque Orientale, 1778, iii, 137.

(52) Trans. N. Y. Agr. Soc., 1848, 680.

(54) Historia Plantarum, lib. viii, c. 4.

(55) 2d Kings, iv, 42; Job, xxiv, 24; Leviticus, ii, 14, and xxiii, 14; Deut. xxiii, 24 and 25; Gen. xli, 5; Matt. xii, 1; Ruth, ii, 14; Sam., xvii, 28. See, also, Pliny, Nat. Hist., lib. xxvii, c. 7; also, Diodorus Siculus.

(51) Agr. of O., 1858, 499.

(53) Odyssey, lib. iv, verses 41 and 604.

ing to Klippart, Cardan, in the sixteenth century says that the wheat cultivated in the Western Indies, under the name of *mais*, approaches by its stature the plant designated in Italy by the name of *melica* or *sorghum*. Casper Bauhin, at about the same time, said that the Lombards named *melaga*, the plant known as *saggina* in Tuscany. Matthioli assures us that the plant known under the name of *me'lega*, was called *melica* in Lombardy; *saggina* in Tuscany; *sorgho* in many regions of Italy. George de Turre, an Italian botanist of the seventeenth century, says the maize or Turkish wheat imported into Italy a few years previously, produced a stem similar to that of the plant named *meliga* or *sorghum*. The Academicians of Cuesca, whose authority bears a great weight in regard to language, render in their vocabulary the Italian word *meliga* (in Latin *melica*) by *saggina*. Targioni-Tozzetti, author of a botanical dictionary justly esteemed, translates the words *holcus sorghum*, L. by *meliga*, *melica*, *melliga*, *miglio indiano*, *panico indiano*. It is only in the Piedmontese dialect that the name *melia* or *meligo* is given both to the *zea* and *holcus*.

The authors who ascribe to corn *Zea Mays*, L. an American origin are also numerous, and embraces the names of many individuals whose authority should have great weight: Dodonæus, 1583; Camerarius, 1588; Matthioli, Gerarde, Ray, Parmentier, Discourlitz, De Candolle, Humboldt, Darwin, F. Unger, Von Heer, De Jonnes, Targioni-Tozzetti, Hooker, Figuer, Thomas Nuttall, Mrs. Somerville, Flint, etc., and I believe that no candid and unprejudiced student can arrive at any other opinion at the present day.

III. ORIGINAL VARIETIES.

The varieties of maize are numberless, and we know of no adequate attempt to reduce them to a system whereby they may be intelligently classified and described. So uncertain are the majority of the descriptions in general use, that it seems impossible to identify varieties except by actual comparison with a typical specimen from the hands of the originator, or the first to apply the name. It is but through access to large collections, and by a careful study of the grain and its plants from every point of view, that success can be expected for any attempt to familiarize the differences which occur. It would be easy to prepare a long list of names, and to classify according to statements made, for this would but require access to files of seed catalogues, and a close poring over the columns of our agricultural press, but then when we had obtained this material, *cui bono*? We shall hence content ourselves with reference to such few varieties of which we have an ascertained history, and which are asserted to have been derived from the Indians.

There are said to be 130 varieties in Spain. Bonafous mention ten varieties of white, twelve of yellow, one of red, and one variegated purple on a yellow ground. Heller describes shortly six varieties as among the best known in Mexico. Salisbury defines forty-four varieties, grouped after a certain form of arrangement. Bement six varieties of yellow and eleven of white. Klippart furnishes a description of seventy-one varieties, and Burr of thirty-four.

King Philip Corn.—So called after the celebrated Indian chief of the Wampanoags of that name, from which tribe the seed was obtained. It has been cultivated from times anterior to the landing of the Pilgrims. It is a hardy plant, with small stalks, and grows to about nine feet in height. The ears are eight-rowed, and from ten to fourteen inches

long.(56) The improved King Philip or brown corn has the kernel coppered, rather large, somewhat broader than deep, smooth and glossy; cob small and pinkish white (57).

Mandan Corn.—Grown by the Mandan Indians on the Missouri river, as high up as its source. It is *Zea Mays, L. Var. Præcox, Nutt.* Culm or stalk very short, spathes or husks arising from the base of the culm; seed mostly in eight rows.

Pueblo Corn.—This is supposed by Dale to be the original corn of America, and is cultivated by the Pueblo Indians of New Mexico and Arizona. The grains vary in color through shades of pink, blue, and white, and the ears are generally rather small and slender. The blue variety is preferred for bread, and is sorted from the rest with much care and stored by itself. The ear has fourteen rows of grains, which are full and plump, and is six and three-quarter inches long, and four and three-quarter inches round (58). This variety is stated to bear a strong resemblance to that which is most common in the New England States; the average height of the stalk is not more than six feet, and the ear is generally within one foot of the ground. The cob is large, writes Mr. Massie (59), but by way of compensation is unusually long. The grain is roundish, instead of long and flat, and the grain or head is in larger relative proportion to the rest of the grain, than is generally the case with the varieties produced in the States. The colors are blue, yellow, white, red, and even jet black.

Sioux Corn.—Also called Golden Sioux and Northern Flint corn, derived from the Sioux Indians in Canada. The cob is large, rather short, and bears twelve rows of moderate-sized grains (56).

Squaw Corn.—Formerly cultivated by the Indians of Michigan. Ears eight-rowed, cylindrical, from four to eight inches long, and from one and a quarter to one and a half inches in diameter. Cob less firm than in some other varieties.

Sweet Corn.—This variety was introduced into Massachusetts in 1779, by Capt. Richard Bagnall, of Plymouth, from the country bordering on the Susquehanna, on his return from the expedition under the command of Gen. Sullivan against the tribes of the Six Nations. There are now varieties with a red cob and a white cob. The ears are short and usually contain eight rows, the grains of which when mature are usually of a light color, and become shriveled when ripe (60). It is probable that this importation is not the original of all the varieties we at present possess, although it perhaps enters into the parentage of the majority of them.

Tuscarora Corn.—This corn is thought to be the variety which was found in cultivation upon the settlement of North Carolina. When the Tuscarora Indians were removed to a reservation in Niagara county, N. Y., in 1712, they brought this seed-corn with them. It has long been cultivated by the Onondagas. It forms a large and tall plant. The ears contain from eight to twelve rows of grain, according to Salisbury, or from twelve to sixteen, according to Bement. The kernels are entirely destitute of a corneous covering, are said to be white or yellow in varieties, are sometimes slightly dented, as broad as long, and of very light weight for corn. The cob is from seven to ten inches long, and of a light-red color (61).

(56) Bement. Trans. N. Y. Ag. Soc. 1853, 333.

(58) U. S. Dept. Ag. Rept. 1870, 420.

(60) Trans. N. Y. Ag. Soc. 1848, 836; 1853, 336, etc. The origin as stated may be questioned.

(61) T. P. Devereux, U. S. Pat. Of. Rept., 1849, 142. II. Powers, ib., 1853, 115. Salisbury, Trans. N. Y. Agr. Soc., 1848, 835.

(57) Burr's Garden Vegetables, p. 173.

(59) U. S. Pat. Of. Rept. 1852-3, 346.

Wild Corn.—Also called Oregon corn, California corn, etc., variously described. Klippart (62) says the cob does not exceed half an inch in diameter; is very pithy; the grains are each enveloped in a separate husk, and attached to the cob. The grain is very flinty, dented, rather ovate, sides convex, and pointed at its place of insertion on the cob.

Salisbury (63) says the wild corn, Rocky Mountain corn, Texan corn, forage corn, *var. Tunicata*, of which there are several sub-varieties, such as the white, the yellow, the red, and the purple. In all of these, each kind is enclosed in a husk, which by cultivation becomes shorter and shorter till it is scarcely perceptible. The kernel is generally small, deeper than wide, dented. Ears from six to twelve inches long. Plant under favorable circumstances large and stout, often from eight to ten feet tall. Mr. E. S. Carman writes: (65) "Wild California or Oregon corn, Rocky Mountain corn, Texas wild corn, cow corn—each kernel is enclosed in a distinct covering, the whole ear also being enveloped in a husk. These secondary husks, which inclose the kernels, are an inch or two in length at the base of the ear. The kernels in many of these are abortive, but higher up the husks or tunics gradually decrease in length, and as this takes place the kernels become fully developed until near the summit, the coverings scarcely enclosing them; in fact, the terminal grains in some specimens protrude more or less. The grains are white, somewhat hard and flinty." Mr. Carman has known this variety to have been cultivated in the Western States for the past thirty years, without yet showing any great variation when planted at some distance from the naked-kernel sort. According to Professor Gray, the seeds of the Brazilian variety produce either common or husked maize. (66) This variety is figured in Bonafous' work, plate v, and by Lindley, as grain from North America, and in the Journal of the Horticultural Society, vol. 1, 1846, p. 115. (67)

Wyandotte Corn.—First introduced in 1853 by J. R. Thomas, of Waverly, Ill., who procured the seed from the Wyandotte Indians. It is pearl white, the meal white as flour, large grains shaped like the yellow flint, soft, twelve rowed, small cob twelve to fifteen inches long (68). Klippart (69) says this curiosity is unworthy of culture, on account of its lightness and lateness. It has many suckers, and all produce tassels and ears, and a single grain is sufficient for a hill. Each stalk may bear from four to eight ears, and each ear from eight to ten rows.

Although botanists are now agreed that there is but one species of corn, yet some of the earlier writers separated *Zea Mays*, L., into a number. Steudel, in his Synopsis Plantarum, furnishes seven: *Zea Mays*, L. *Zea hirta*, Bon., the hairy maize, having its leaves and husks hairy, and its spikelets sessile or seated close on the male flower, its leaves nearly parallel with the culm, pendulous; from California. *Zea rostrata*, Bon., spike elongated; seeds at the apex recurved, mucronate; in Peru. *Zea macrocarpa*, Klotzsch, seeds compressed plane; albumen all farinaceous; in Peru. *Zea curagua*, Molini; culm low; leaves serrate; in Chili; sometimes called stone maize. *Zea cryptosperma*, Bon.; this is the

(62) Agr. of O., 1858, 524. Figures given.

(63) Trans. N. Y. Ag. Soc., 1848, 837.

(65) Moore's Rural New Yorker, March 3, 1877. Figures given. The variety probably the same as figured in U. S. Pat. Of. Rept., 1853, 98. A colored kernel is figured in the frontispiece of this latter reference.

(66) Darwin. An. and Pl. under Domes, i, 386.

(67) See also De Candolle, Geograph. Botanique, p. 951, and Teschemacher, in Proc. Boston Soc. of Nat. Hist., Oct. 19, 1842.

(68) Agr. of Mass., 1858, 75.

(69) Agr. of O., 1858, 517.

covered maize, or wild corn; in Buenos Ayres. *Zea erythrolepis*, Bon., or red-husked corn, with grains compressed, glumes red.

With but trifling exceptions, any specific distinction here afforded, may be found in a field of one variety of cultivated corn, as few plants are subject to wider variation of habit.

IV. VARIATIONS.

We shall here give an incomplete list of variations, using for illustration, as far as may be, the varieties which have been described by authors, in preference to those in our own collection or our own observation :

1. COLORS.

| | |
|-------------------------------|-----------------------------------------------------------------------|
| Amber-colored | Early sweet varieties. |
| Semi-transparent, white. | Sweet varieties. |
| Semi-transparent, yellowish.. | Sweet varieties. |
| Flesh-colored | Eight and twelve-rowed flesh. <i>Salisbury</i> . |
| White | White-flint, White gourd seeds, etc. |
| Dead-white | Tuscarora. |
| Yellowish white | R. I. Asylum, early dwarf sugar. <i>Burr</i> . |
| Tawny | Smutty-white, of Cape Cod. |
| Yellow | Canada yellow, yellow dust, etc. |
| Orange | New England eight-rowed, in varieties. |
| Red; | Red pop, New Eng., 8-rowed red, Hematite. <i>Salis-</i> |
| Dull red | Master. <i>Klippart</i> . |
| Red tinged..... | Red blaze. <i>Salisbury</i> . |
| Copper red..... | King Philip. |
| Purple | Purple Wyandotte. <i>Klippart</i> . Red-kerneled rice. |
| Blue | Pinto. <i>Heller</i> . Omaha. <i>Klippart</i> , etc. [<i>Burr</i>]. |
| Dark brown | Illinois brown. <i>Klippart</i> . |
| Black | Mexican. <i>Flint</i> . |
| Slate black..... | Mexican sweet. <i>Burr</i> . |
| Variiegated | Calico. <i>Salisbury</i> , and hybrids without number. |

2. NUMBER OF ROWS OF GRAIN IN EACH COB.

| | |
|--------------------|------------------------------------------------------------------------|
| 8-rowed..... | Golden sweet. <i>Burr</i> . Canada yellow. <i>Burr</i> . |
| 8 to 10-rowed.... | Narragansett. <i>Burr</i> . Baden. <i>Klippart</i> . |
| 8 to 12-rowed.... | Mexican flint, <i>Klippart</i> . |
| 10-rowed..... | white pop. <i>Klippart</i> . Chinese tree. <i>Bement</i> . |
| 10 to 12-rowed.... | Dalton. <i>Burr</i> . Yellow flint. <i>Burr</i> . |
| 10 to 14-rowed.... | Early Adams. <i>Klippart</i> . Peabody's prolific. <i>Klippart</i> . |
| 10 to 16-rowed.... | Wigwam. <i>Klippart</i> . |
| 12-rowed..... | Golden Sioux. <i>Bement</i> . White flint. <i>Bement</i> . |
| 12 to 14-rowed.... | Red cob sweet. <i>Burr</i> . Bayou. <i>Klippart</i> . |
| 12 to 16-rowed.... | Illinois yellow. <i>Burr</i> . Bonum. <i>Klippart</i> . |
| 12 to 18-rowed.... | Stowell's evergreen. <i>Klippart</i> . |
| 14-rowed..... | Trumbo. <i>Klippart</i> . |
| 14 to 24-rowed.... | Wabash. <i>Klippart</i> . |
| 16-rowed..... | White cap. <i>Klippart</i> . |
| 16 to 22-rowed.... | White Horse-tooth. <i>Burr</i> . |
| 16 to 24-rowed.... | White gourd-seed. <i>Klippart</i> . |
| 16 to 26-rowed.... | Tree corn. <i>Klippart</i> . |
| 18-rowed..... | Gourd-seed. <i>Klippart</i> . Yankee. <i>Klippart</i> . |
| 18 to 32-rowed.... | White gourd-seed. <i>Burr</i> . |
| 20-rowed..... | Large white Tennessee. <i>Klippart</i> . Pennsylvania. <i>Klippart</i> |
| 24 to 26-rowed.... | Large yellow gourd-seed. <i>Salisbury</i> . |
| 24 to 36-rowed.... | Virginia white gourd-seed. <i>Bement</i> . |

We also find statements of forty and forty-eight rows of grain for single ears.(70)

3. MAXIMA AND MINIMA.

The largest cob we have seen was one exhibited at the Centennial Exhibition at Philadelphia, which was, when dry, fourteen and a half inches; this was an eight-rowed variety. We find record for maxima: ears twelve to thirteen inches in circumferences and from twelve to fourteen inches long; another ear twelve inches long, nearly ten inches in circumference and bearing 1,446 kernels, three-quarters of an inch in length; another ear mentioned as containing 1,006 kernels, and being sixteen inches in length.

The smallest ears we have seen have been one inch long. Mr. J. B. Walker, Concord, N. H., has a variety of pop-corn from Vermont, which bears, as a crop, ears only from one and a half to two inches long.

As to the size of the kernels, we have noted in one small collection a range in weight as six to one, as between the Benton corn, from Connecticut, and an ordinary golden pop-corn; Darwin, in a small collection, found a difference by weight between kernels of two varieties as seven to one.

4. VARIATION IN COLOR OF COB AND GRAIN (71).

White cob and White kernels..... White Flint.
 Flesh-colored kernels... 8-rowed flesh.
 Red tinged kernels.... Red blazé.
 Red kernels 8-rowed New England red.
 Blue kernels..... Blue pop.
 Black kernels..... Mexican sweet.
 Yellow kernels..... Canada yellow.
 Variegated kernels.... Calico.

Red cob and White kernels..... White Virginia Gourd Seed.
 Yellow kernels..... Ohio Dent.
 Red kernels..... Red pop.

Red and white cob and White kernels..... Early white. *Klippart.*
 White and red cob and White kernels..... Hackberry white. *Klippart.*
 Pinkish white cob and White kernels..... Tuscarora. *Burr.*

5. VARIATIONS IN MATURITY.

Parmentier mentions a corn in Hungary which ripens in sixty days, but we are rather distrustful of our quotation; a variety in the Ionian Isles, called cinquantino, is said to ripen in fifty days.(71)

Salisbury gives ninety days for the small yellow pop corn, and 135 to 150 days for the Pennsylvania dent. Flint says the Canada corn ripens in 100 days from planting; the Rocky Mountain corn in 140 days; the range in the United States seems from 100 to 200 days.(72) Darwin from his authorities, states as the limits, three or four months for the dwarf kinds, and six or seven months for the taller varieties.

6. VARIATIONS IN GROWTH.

Flint mentions corn in Tennessee, when the plant averaged in fields sixteen to eighteen feet high, and exceptional stalks measured twenty-two feet three inches long.(73) John J. Thomas states that this plant has been known to attain the height of thirty feet in the West Indies.(74) Morelet says of Central America:(74') "Our eyes wandered over undulating expanses covered with maize, the stalks of which here often reach the height of from seven to eight yards. We carefully noted the stalks

(71) Except as noted, the authority is Salisbury.

(72) U. S. Pat. Of. Rept. 1848, pp. 652-655.

(74) Trans. N. Y. Agr. Soc. 1843, p. 181.

(71') U. S. Pat. Of. Rept., 1859, p. 121.

(73) Agr. of Mass. 1853, p. 71.

(74') Trav., p. 226.

of corn exhibited at the Centennial, and although we did not actually measure any specimen, yet we are quite confident that some exceeded fifteen or sixteen feet in height; the tallest we have actually measured has been fourteen feet ten inches. Bouafous(75) describes a dwarf variety sixteen to eighteen inches tall. We have never seen a variety growing in fertile soil which was under four feet, yet individual hills, on sterile land, may show a much smaller growth. In the twenty varieties grown side by side by Salisbury, all planted on the same date, one variety the small eight-rowed Canada began to flower July 10, while the latest flowering variety was the Rocky Mountain corn, August 10, a variation of one month; the tallest plant was the large white flint, ten feet six inches; the shortest growth, the squaw corn five feet ten inches.(76) The height which a corn plant may assume, depends largely upon the closeness of planting and the fertility of the soil; a nitrogenous manure and close planting tending to elongate the nodes, and thus to lengthen the plant over what it might otherwise have measured. In some varieties, we have naturally a more elongated node than in others; and hence we have a different appearance to the leafing. Some varieties, like the Wyandotte, are disposed to sucker greatly; other varieties show but a feeble tendency to increase their stalks in this manner. Some varieties bear their ears high up, others low down on the stalk. Some varieties normally show a tendency to bear several ears to a stalk, others but one ear, and still others are so feebly prolific that many stalks show no ear whatsoever. We have counted nine ears to a stalk, have found record(77) of a stalk having been exhibited at an agricultural fair, which had twelve ears, and have been told of fourteen to a stalk. Some varieties bear a terminal ear on a branch, other varieties bear the ear axillary, and exceptionally a branch may occur with several axillary as well as a terminal ear. Some varieties bear their ears on determinate nodes, so much so, that this habit seems strongly characteristic.

7. VARIATIONS FROM CLIMATE.

It is a common observation among farmers that corn changes its character when removed from one locality to another. Thus Canada corn removed to New Hampshire or Massachusetts shows a marked tendency towards lengthening of the ears, often towards a change from a strictly 8-rowed variety to one containing many ten and twelve-rowed ears, and a stronger and taller growth of plant. Southern corn moved north is said to grow smaller. Flint corn, removed from the hill fields to intervals, to assume a dent character, or even, in cases, to be entirely changed, and *vice versa* for the gourd-seed varieties, which tend contrariwise, towards the flinty habit. No corn, unless restrained within its type through the exercise of the art of selection, can maintain its original character when removed to regions where it meets with a different set of adaptations to be overcome. The corn-plant is, however, so subject to change through cross-pollination, that it is difficult to study the influence of climate on its growth, for oftentimes we must believe that the change of a variety into another analogous to that cultivated about it, is often due to unnoticed pollination by the variety predominant in the vicinity (78).

(75) Nat. Hist. du mais. See Scientific Farmer, Aug., 1878, p. 117

(76) Trans. N. Y. Agr. Soc. 1848, pp. 766-769.

(77) U. S. Pat. Of Rept. 1847, p. 131.

(78) For references see U. S. Pat. Of Reports, 1849-50, 124, 142, 169, 175, 182, 224, 226; *ib.*, 1850-1, 371; *ib.*, 1848, 135; *ib.*, 1847, 391; U. S. Dept. Agr. Rept., 1862, 229, etc.

8. HYBRIDIZING.

By this term we mean the cross-fertilization, or the influence of pollen from one variety acting upon the ovule of another, and not the crossing of distinct species, as would be inferred from the accurate meaning of the word "hybridize"—*i. e.*, the crossing of *species*. As the influence of pollination as changing the character of the fertilized ovule is not clearly recognized by scientific writers, we shall devote a little space to this branch of our subject.

Thus Gaertner (79) affirms that the pea seems an exceptional plant, as being influenced in its color by the pollen from another variety, and distinctly states that the white dwarf variety of corn, when inoculated with the large, red-striped form, produces seeds which exhibit no change of color, though when sown they give rise to variegated spikes. Darwin (80) says distinctly that the pollen of one species or variety, when applied to a distinct form, occasionally causes the coats of the seeds and the ovarium or fruit, including even, in an instance, the calx and upper part of the peduncle of the mother plant, to become modified. Sometimes the whole of the ovarium or all the seeds are thus affected; sometimes only a certain number of the seeds, as in the pea, or only a part of the ovarium, as with the striped orange, mottled grapes, and maize are thus affected. He again writes (81) that when peas of one color are artificially fertilized by pollen from a variety of another color, peas of the two colors may appear in the produced pod. This has been proved by Gaertner and Berkeley, so far as the influence of the pollination on the *skin of the pea*, etc. Galesio fertilized the flowers of an orange with pollen from the lemon, and we find those produced bore a longitudinal stripe of peel having the color, flavor and other characters of the lemon.

We might offer other instances which we have met with, but as Darwin, with a far superior knowledge of the credibility of authorities, has quite fully treated this subject, we may conclude that the present state of science credits the influence of the pollination in modifying the seed to be limited to the skin or outer coating alone. As this is not in accordance with the facts as we have observed them, we proceed to give the result of our own observation.

The silk, succulent and translucent, emerges from the sheath, and evidently remains in this condition for a considerable period, even two or three days, or even longer, if pollination is not effected; so soon, however, as the pollen gains access, it turns brownish and dies at the extremities; and, under favorable conditions, this change need not occupy more than a day. By removing the silks under the microscope, and brushing them with the pollen, these minute grains were observed to adhere, and after a time to change their shape and become wrinkled, yet but slightly, and to send out a tubular prolongation. When numerous grains were lodged on the silk under examination, in a few hours the texture of the silk became changed, showing less transparent and certain other differences difficult to be expressed. This is in harmony with the description of the action of pollination as given by Thome, but I was unable to detect the whole process. He says (82): "When pollination has been fully accomplished, the pollen grain, excited by the viscid fluid exuded by the stigma, puts out one or more long tubes, the

(79) Journal Horticultural Society, London, 1850, 165.

(80) An. and Pl. under Domes. i, 482.

(81) *Ib.*, i, 429.

(82) Text-book of Struct. and Phys. Bot. By Otto W. Thome. Translated by A. W. Bennett. New York, 1878, p. 187.

pollen-tubes, which are unicellular and usually simple. These penetrate through the conducting tissue of the style, and reach the interior of the cavity of the ovary in a few hours; in the case of *Colchicum* in about twelve. Then they come into contact with the ovules and attach themselves closely to them," etc. When we consider the size of the pollen grain of corn (about one-three-hundredth of an inch in diameter) and the length of the silks (occasionally eighteen inches or more for the butt grains), we must believe that the pollen tube elongates by the absorption of nutriment from the cells of the silk. We have proven that the stigmatic surfaces of the silk extend quite a distance from their extremity, for several ears of sweet corn were opened by us, the extremities of the silks all removed with a knife, and yet the silks elongated and received the pollen, and the kernels *all* developed with the exception of a few at and about the top of the cob.

Now, when a kernel fails to become fertilized, there is an influence exerted on the cob, for when the central portion of the cob fails to become fertilized as to its grain, the cob shrivels at this point very greatly, and becomes hard and woody, while the cob under the fertilized portions is pithy and cellular and succulent; indeed, in these cases we find the cob at either extremity of the ear normally developed, but the intervening portion of small diameter, and of an obviously different nature. We here have the effect of cross-breeding exercised on that portion of the plant which bears the grain! Indeed, the same fact is illustrated in those more frequent cases when some few only of the ovules of the cob receive pollen. What a difference at harvest between the flexible, flimsy, unfertilized cob, and the rotund, hard and tough cob which is studded so abundantly with grain. This action of the pollen probably affects the habit of growth of the whole plant, for the trained eye can determine at a distance with considerable certainty, as we have many times proven to doubters, the ear-bearing and the non-ear-bearing stalks, which occur in fields which we have studied.

Professor Beal states (83) that the different kinds on the same ear may have twenty or more different parents. He shows some ears where sweet corn and pop corn had been planted near each other, where the color, size and texture of some of the kernels had been changed. We have seen an hybrid corn made up of five distinct varieties; we have observed yellow corn, white corn, flint corn, dented corn, red corn, and sweet corn kernels occupying the same ear, sometimes two varieties only, sometimes three, sometimes all, and we see no reason why if twenty distinct varieties of a similar flowering period were planted together, we should not recognize all the twenty on some ears of the crop of the same year.

We have noted, as an effect of cross-pollination, a change of color, a change of shape, and a change of quality. Not only is the change not confined to the skin, the episperm or testa, but extends to the albumen or endosperm, and even to the chit, the embryo, or germ. If the grain of a pop corn, a flint corn, a dent corn, and a Tuscarora corn, be split, there will be seen three arrangements (two in the Tuscarora) composing the chit, the white, starchy portion, and the corneous portion, each well defined and bearing different relations to each other. If the cross-bred corn of these varieties, all grown on the same cob, but with their peculiar male parent, be examined, they will be sure to present these same

differences, each according to their outward change. The pop corn will show its visible oil or corneous portion, extending even to the chit, and will pop; while its neighbor, a flint corn, will show a broad, white, starchy portion between the chit and the corneous portion, and will not pop, etc. Indeed, the chits even will show each a difference, and will appear allied to the variety whose form they have assumed. If the corn grains are split and treated with chemical solutions, sulphate of copper, will produce a green coloring to the chit, and iodine a violet coloring to the starch, while the corneous portion will retain its proper color. We hence have defined, not the absolute presence or absence of oil, etc., from the colored portions, etc., but a strictly defined division of physical arrangement, which differs in relative size with the varieties and in the manner of its arrangement.

In the forming of varieties, this cross-fertilization bears a large part. Thus, the difficulty of maintaining more than one variety on the farm, unless the blooming period be different. We quote from Burr, that the golden-sugar corn is the result of a cross between the Canada, a flint corn, and Darlings Early, a sweet corn; that the Old Colony Sweet was formed from the Southern White and the common sweet corn of New England, but when these hybrid varieties are formed, it requires a long series of selections to fix the new type, and to prevent its occasionally reverting to one or the other of its ancestors.

These eight headings, under variations, are but shortly treated, and are designed to illustrate the difficulty which must attend a botanical history of corn, as well as to give impress to a few facts of general concern. They have a connection with our subject as formulating some of the facts which must be used in the effort to trace corn to its origin through its variations; a task by no means hopeless, yet one which shall require the deepest study and the most pains-taking investigation. It had been our intention to have attempted the tracing of climatic variation and its correlative effect upon the distribution of this cereal, but we find the data we have collected as yet insufficient. We will but say that variation can be brought about and fixed, by means of which the culture of corn can be constantly extended beyond its present limits, as is shown by its wide range of adaptations, and its pliability in the hands of man; and that this same variation can be used to greatly extend its cropping capacity through inheritance guided by the intelligent mind.

V. INDIAN CULTIVATION.

Among the aborigines, as in many, if not all the uncivilized tribes of the world, the care of the fields was consigned to the females of the tribe, and Schoolcraft mentions that among our Indians the corn-planting and the corn-gathering was done by the women and children, aided by a few of the superannuated old men. This was not considered a hardship, but rather, in their view, an equivalent for the onerous and continuous labor of the men in the chase and in war. They held many superstitions concerning the corn crop, and merriments connected with the joyful season of harvest, which even now are not unknown in rural neighborhoods. "If one of the young female huskers finds a red ear of corn, it is typical of a brave admirer, and is regarded as a fitting present to some young warrior." Compare this with the practice even now in vogue in our farming districts, where the finder of the red ear is entitled to give or receive a kiss. Curiously enough, the present mode of culture

differs but slightly from that culture taught by the Indians to the colonists at Jamestown in 1607.

The Indian method was laborious, as would be expected when tools, save those rude ones made from the sliver of wood, or of a clam shell, or a flat stone, were unknown. A space was first cleared, in New England, and along the coast, by burning the dead wood; the debris was then collected into piles, which were again treated with fire; and thus, through perseverance and toil, a free space was gained from the forest. The Indians of the coast understood the value of manure, for they would bring sticks to the cleared land to be burned, and oftener added a fish from the sea, a sucker from the stream, or a horse-shoe crab from the beach, to each hill. These coast Indians then dig holes about four feet apart, using a rude hoe formed from a clam shell, or of the flat shoulder-blade of the moose, or of a crooked piece of wood. Into these holes the fish were dropped and covered, and then about half a dozen kernels of corn. They then carefully protected the field from the ravages of birds and vermin, and as the corn grew the earth was laboriously scraped up around the stalks with clam shells until each hill was about two feet high.(84) The Sieur de Champlain, in 1605, touched at the mouth of the Kennebec river. In his journals, he says: "Here we saw Indian corn, which they sow three or four grains in a place, covering them with earth; at a distance of three feet plant as much more, and so on. They plant their corn in May and gather it in September." At the Saco river: "The savages told us that all who inhabited this region cultivated and sowed the land like those we had seen." At Cape Cod, July 21st: "We landed, and passed through a field of corn, planted like those we had seen before. The corn was in blossom, and about five and a half feet high. * * * There were also several fields not cultivated, being left to recruit in fallow," etc.

In New York State, an old Oneida Indian stated to Mr. Schoolcraft, that "in ancient times the corn hills were made so large that three clusters of stalks were raised on each hill, and that the hill once prepared was used year after year, causing them to be kept large, and accounting for their distinct continuance to this day."

In Minnesota, in 1819-20, the Sioux Indians planted the corn in hills raised from eight to twelve inches high, the top leveled to the size of six or eight inches in diameter, and made by means of a hoe purchased of the traders, or the branch of a tree sharpened.(85)

In the dry regions of the southwest, where it would seem that a crop could only be grown by irrigation, the Navajos have a peculiar custom, whereby moisture is conserved for the young plant until it passes through the germinating period. The roots are placed far below the dry surface, and in the region of moisture, by forming holes twelve or eighteen inches deep by means of sharpened stakes which are driven into the ground to form the planting places. One or more kernels of corn, previously enveloped in a ball of mud about the size of the fist, are dropped into these holes, and covered with light earth to the depth of two or three inches. As the moisture of the mud brings about germination, the roots extend immediately into the moistened lower strata of the soil, and thus this method seems to provide a crop when corn planted in the ordinary way, near the surface, would perish.

(84) Champlain's Voyage. Prince Soc. Ed., 121, 64. Wood's New Eng. Prospects; 1st ed., 81, etc. This description applies also to Virginia, see Capt. John Smith's account of the Indians of Virginia.

(85) P. Prescott, U. S. Pat. Of. Rept., 1849-50, 451.

VI. PRODUCTS.

The Indians and natives of the countries where it occurred, eat it green and roasted or boiled; also, the dry grain boiled (the prototype of our hulled corn), parched or bruised into a flour of which various kinds of bread were made. They also made an intoxicating drink from the grain, and extracted the oil, which served them as a butter. Mr. Winthrop says the Indians made samp from it. The Peruvians made vinegar. At the present time, the grain enters largely into consumption as food for animals, either ground or whole. It is also extensively used in the form of meal in our families, and occurs also prepared in numerous ways. Thus: whole, as hulled corn; cracked and broken, as varieties of preparations known as samp, hominy, etc.; ground and specially treated, as maizena, farina, corn-starch, etc., which are served in the form of puddings on our tables; and but few of us but are familiar with its preparations under the name of hasty pudding, johnny-cake, hoe-cake, mush, corn-cakes, corn-bread, Indian pudding, hominy, succotash, etc.. The grain is also used largely for the manufacture of whisky. Glucose has also been made from it by treating corn-starch with sulphuric acid. The green corn is a favorite vegetable, as we all know, and the business of canning for winter use employs a large capital.

The stalks furnished a kind of honey to the Peruvians, from its juice, and to the Mexicans a kind of sugar. During the Revolutionary War, it was quite common for our farmers to procure from this source their family stock of molasses. In the New York Agricultural Society's Transactions for 1843, will be found an account of sugar-making on quite a large experimental scale. The stalks also furnish an excellent fodder for cattle when well cured, being worth for feeding purposes from one-half to three-fifths the value of good hay. Fodder corn, or the stalks cut green, is a well-known and appreciated cattle food, largely grown to supplement the pasturage during the month of drought.

The husks are used in the domestic manufacture of mats, being first soaked and then twisted and braided. The inner husks will make a beautiful writing paper, and a greyish paper can be made from all parts of the plant. Cobbett published a book on corn printed on paper made from the plant. The husks also find use as a stuffing for mattresses. Experimentally, they have been successfully used for making a textile fabric, a sort of crash. (86)

Finally, the pith may be used for cleaning metal, as the threads of fine screws; the cob furnishes a good kindling; an excellent dye has been extracted from the grain.

VII. POSTSCRIPT.

CLASSIFICATION OF VARIETIES.

As a prelude to a careful investigation into the history of the distribution, habits and variations of the corn plant, it seems necessary to devise a scheme for the classification of varieties. No satisfactory one has yet, so far as we are aware, been proposed, and it is probable that our knowledge of the corn plant is not as yet sufficient to admit of a natural classification. Bonafous attempted to do it by color, but this is entirely unsatisfactory. Flint makes no real attempt. Salisbury succeeds to a certain extent, but his scheme is quite faulty as based on the

characters of the seed alone, not on the ear, and upon characters which are exceedingly changeable. His grouping is as below:

1. Those the kernels of which have a corneous portion, and are rather shriveled or indented.

2. Those the kernels of which are destitute of a corneous portion, and are rather shriveled or indented.

3. Those the kernels of which have a corneous development on their sides, and a dent or depression on their crowns.

4. Those the kernels of which are destitute of a corneous portion and shrink or contract at maturity, giving a shriveled appearance to the epidermis.

5. Those the kernels of which are destitute of a farinaceous portion, and at maturity shrink or contract, giving a shriveled appearance to the epidermis.

6. Those with each kernel inclosed in a husk or spalter-like envelope, aside from the general covering of the ear.

Under these divisions he forms classes based on the color of the kernels and the cob, and within these classes are placed the varieties or kinds which have the ear and grain specifically described.

Klippart attempts a division into hard and soft corn, but does not make a success of it. Flagg forms five divisions, according to uses, the most artificial arrangement possible. Thus:

1. Feeding corn, comprising the dent and gourd-seed corn, preferable for its softness.

2. Meal or flour corn, comprising the hard or flint corn, which is too hard for profitable feeding, but keeps better when ground.

3. Roasting ear corn, embracing the sweet and sugar corn.

4. Pop corn.

5. Fancy varieties, such as those cultivated for ornament or curiosity, that have no particular value for any useful purpose, such as the Japanese maize.

We are fully aware of the difficulty in classifying the varieties of corn, and the provisional arrangement we would suggest is partly artificial, partly a natural system. Yet it seems necessary that there should be some scheme devised by which varieties can be identified so as to admit of ready recognition, in order that their affinities and varieties may be noted in an understanding manner.

Every one knows that there are four kinds of corn—the pop corn, the flint corn, the sweet corn, and the dent corn; and this is equivalent to saying that there are structural differences which may be seen between the ears of these kinds. Every one knows that ears of corn of these varieties present differences which are readily recognized, and that there are apparently closer affinities between the pop corn and the flint corn than between flint corn and the true dents. So in the growth of the plants under culture we recognize a certain variation which exists between varieties, the pop corns being dwarf, the dents being tall-growing plants; certain sweet corns producing their ears of crop at the lower nodes, and certain others at higher nodes, etc. It is not as well known that the number of nodes on varieties may vary, and that they seem quite constant in certain varieties.

If we break the ears in two at the middle portion, and observe the shape of the grains and the cob, at the section of the fracture, we will have suggested to us four separate types of arrangement on the cob, thus:

A. Grains of a rounded surface, forming an undulating outline. This division includes the pop corns, the flint corns, the Canada corns, and the Tuscarora corn, and perhaps others.

B. Grains of a flattened surface, the broken ear showing a rounded outline. This division includes the dent corns, sweet corns, and possibly others.

C. Grains so formed as to leave a triangular sulcus or furrow between the rows. This division takes in the Tennessee prolific corn, and perhaps others.

D. Grains partially or completely enveloped in bracts, as the wild corn, so called.

These four groups, *A, B, C, D*, are natural groupings, which every one familiar with corn collections will immediately recognize. The Yankee expresses the groups under *A* and *B*, the only two with which he is familiar, as Eastern and Western corn, and also locally as field corn and sweet corn; and every variety we have seen can readily be assigned to the one or the other of these groups.

Under *A, Grains of a rounded surface*, we can subdivide into *a*, pop corns, *b*, the flint corns, *c*, exceptional corns of peculiar character: *a*, or *pop corns*, are distinguished by their exploding, when brought gradually to a certain temperature, into a large, pure-white, starchy, elastic mass. This is brought about through the distribution of the oil throughout their substance, so that when the oil vaporizes it everts all portions. If a pop corn be split, the corneous portion will be seen in some varieties to extend almost or quite to the chit; in other varieties there will be a shallow farinaceous portion between the chit and the thick corneous envelopes, and thus the structure carries the pop corn close to *b*, the flint corns, which have a corneous envelope about the grain, and a large farinaceous portion between this covering and the chit. The Tuscarora corn, which comes under our division *c*, has a rounded kernel, is allied in external arrangement to the pop and flint corns, but structurally varies in having no corneous coating, but in the farina extending from the chit to the outer coating or epidermis.

Under *B, grains of a flattened surface*, we can subdivide into (*x*) sweet corn and (*y*) field corn. Sweet corns (*x*) are distinguished by their wrinkled kernel, and the corneous portion constituting the bulk of the seed. Field corns (*y*) are distinguished by the summit of the grain being destitute of a corneous covering, and hence becoming dented as the grain dries in ripening.

A further subdivision under each section may be made, based on color of kernel, color of cob, number of rows, shape of kernel, etc.

It would be presumptuous in us to claim that these divisions we have offered will include every variety. We can only say that they include every variety we have as yet seen, and seem to be based, in their typical specimens at least, on natural and easily recognized systems. This arrangement of ours can be arranged in a form comparable with the botanical system, as below:

| ORDER. | GENERA. | SPECIES. | VARIETIES. |
|------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------|---------------------------------------------------------------------------------------------------|
| A. Grains of a rounded surface forming an undulatory outline to the ear in cross-section | a. Pop corns.. | { 1. Parching corn.. 2. Rice corn, etc.. | { 1. White. 2. Yellow, etc. 1. White rice. 2. Yellow rice, etc. |
| | b. Flint Corns. | { 1. Canada corn... 2. White Flint'... | { 1. Waushakum corn. 2. Dalton corn, etc. 1. Rhode Island White Cap. 2. Long white, etc. |
| B. Grains of flattened surface or filling a circular outline in cross-section of ear..... | x. Sweet Corn. | { 1. Evergreen..... 2. Mexican, etc.... | |
| | y. Field Corn.. | { 1. Iowa dent..... 2. Baden, etc..... | |

I have insufficient material to fill out *c* and *d*, and therefore shall not attempt it. This scheme is sufficiently elastic to receive all known varieties, I think, and to enable an unknown species described in accordance with this system to be quickly identified. It also seems to provide a place for the many varieties which are produced through hybridization and selection, because it seems to bring allied forms together, as well as those which are more readily convertible, the one type into another. I present it with diffidence, however, as I have had no opportunity to test its value in the study of large collections of corn from diverse regions.

POSTSCRIPT II.

Since the above was in type, we find other information which adds somewhat to our history of corn :

NEW HAVEN, *April* 18, 1879.

MY DEAR DR. STURTEVANT :

You ask for notes relating to the *History* of the corn plant. I have among my books old Kybers' *Botany*, 1552 [Hieronymi Tragi, de stirpium Maximæ Earum quæ in Germania nostra nascentur * * * intrepredo Davide Kybers Argentinense]. (Hieronymus Bock (or Tragus as he wrote it), one of the earliest writers on German plants, born 1498, was a teacher, director of the Royal Gardens, etc., died 1554. He published in German, in 1539, without illustrations; then in 1551 a new edition. This is Kybers' translation into Latin; the wood-cuts in this translation were designed for the edition of 1551. So this brings back the date a little), in Latin, with figures and description of maize (the earliest figures I am familiar with), under the name of *Turkish Korn*, the name it still has in Germany. (Everything foreign or barbarous was *Turkish* in the Middle Ages.)

Also *Gerarde's Herbal* (in English), Ed. 1597, the many figures of corn *uncolored*. I have seen colored figures showing red, white, yellow, spotted, and blue grains even then.

Also, old *Hernandez' Natural History of Mexico* [Nova Plantarum, Animalium et Mineralium Mexicanorum Historia a Francesco Hernandez, * * * Rome, 1651]; was sent by Philip II. to Mexico, where he remained 1591-1600. His first edition, published in Spanish, in Mexico, in 1615. There is not a complete copy of this to be found now in Europe.

He brought back seventeen volumes of drawings and manuscripts, twelve of which were burned in Spain; and this Latin edition is of

what was left, brought out in Rome first in folio in 1628, then in 4to in 1651. It is probable, therefore, that the text describes the condition of maize, its cultivated variety as it was in Mexico before 1600; the 4to edition, Rome, 1651, with figures and long Latin description.

This is important on some accounts, because he was a great student and his work a great one. * * *

The following notes from Bretschneider may interest you:—

Dr. E. Bretschneider, physician of the Russian Legation at Peking, published at Foochoo, in 1870, a pamphlet "On the Study and Value of Chinese Botanical Works, with notes on the History of Plants and Geographical Botany from Chinese Sources."

He had made a special study of this. He says (p. 7 of his pamphlet), "In the same manner it can be proved, from Chinese sources, that maize and tobacco are not indigenous in China."

On page 18 he goes into this more fully, with the Chinese characters involved, etc.:—

"I have already stated that the maize, a native of America, has been introduced into China. *Li-shi-chên* was the first Chinese author who mentioned it, at the close of the sixteenth century, under the name of [my notes in these [] braces.—W. H. B.] [Gives the Chinese characters] *Yii-shu-shu* (Jade Sorgho);" [then he gives references]. He states that it was introduced from Central Asia. "Nowadays it is largely cultivated in China, and bears in each province a different name [more references]. The Persian name of maize is *Ghendum* i Mekka (wheat from Mecca), that seems to prove that maize, after being brought from Europe, spread over Asia from west to east. * * * At Peking, maize is called [gives the Chinese characters] *Yii-mi* (Jade Corn.) * * * Maize is abundantly cultivated in the neighborhood of Peking, and the bread baked from maize forms one of the cheapest articles of food of the poor. [In a foot-note he says that maize is so cheap in Peking that even beggars enjoy, from time to time, the luxury of eating maize-bread; the usual food of beggars in China being such as dogs eat, often collected in the streets where it had been thrown.] [He then says that he had inquired of old men in Peking, all of whom said that maize had been cultivated there as long as they knew anything about it.] "Moreover, a learned Chinese assured me that the cultivation of maize near Peking dates from the end of the *Ming* Dynasty, 1380-1644."

In the author's "list of Chinese works," quoted in the foregoing notes, sixty-one are cited; of the works written before the third century B.C., there are eight.

To return to *Hernandez*. While I think it is abundantly proved that the plant was cultivated in America at the time of the discovery, I think it as abundantly proved that it was unknown in the Old World. (That is why I have quoted Bretschneider so fully, for those who ascribe an Oriental origin usually refer to the Chinese.) *Hernandez*, in his time, thought it American. He says even the barbarous tribes knew it. * * * I write this in response to your note, page 56 of the *Scientific Farmer*.

Yours truly,

WM. H. BREWER.

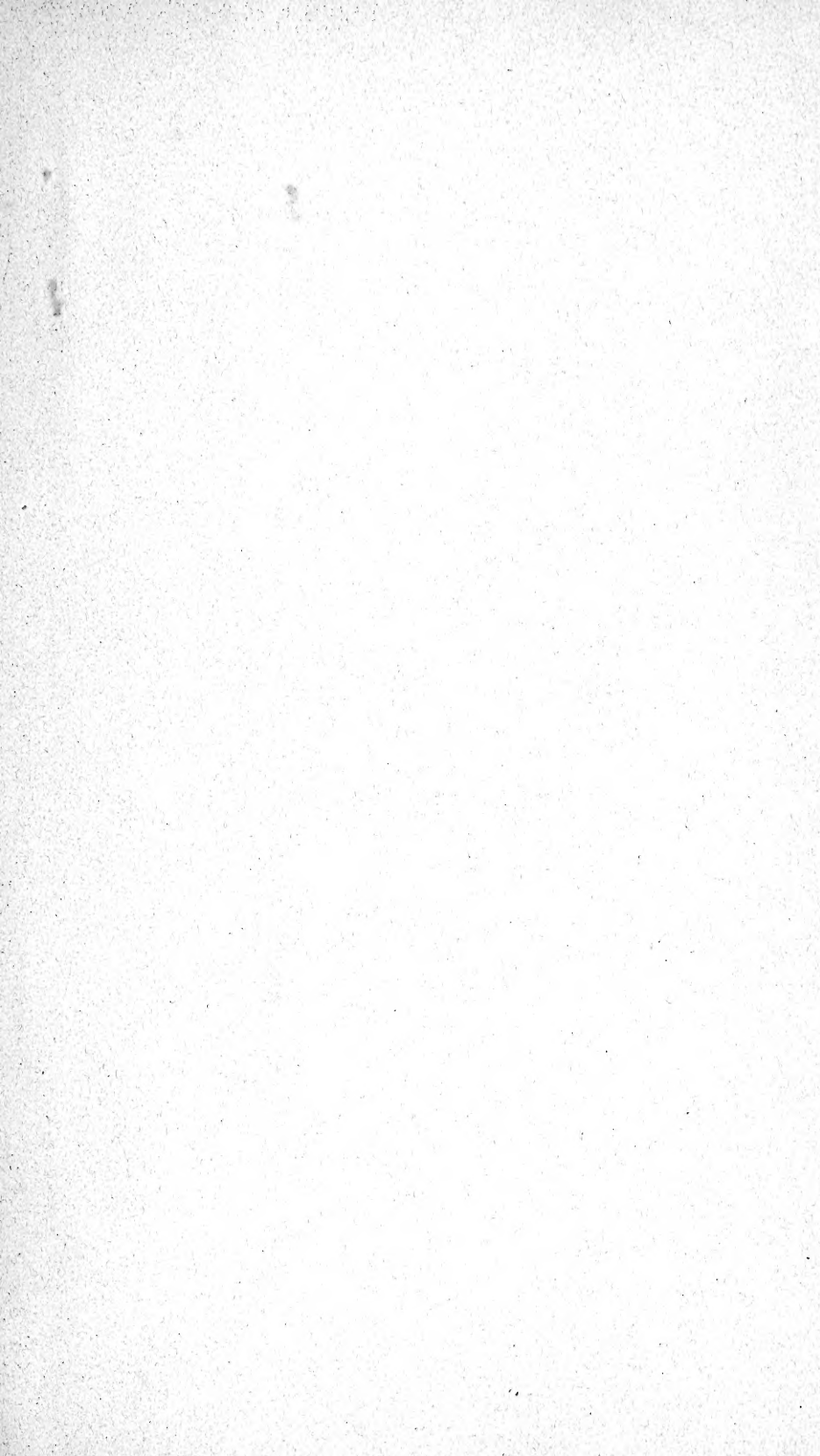
P. S.—I used to think maize, like some other plants, might belong to both the Old and New World. Now I do not think so.

In 1869, I met a Mr. Roetzl, a German, with some considerable botanical knowledge, who had spent sixteen years in Mexico, and had botanized

there somewhat extensively. I asked him if he had ever seen *Zea Mays* WILD there. He had not, and doubted if it was found in Mexico; but, what was interesting to me, he found in the State of *Guerero* a *Zea* which he thinks specifically distinct, and he thinks undescribed; the ears very small, in two rows "truly distichous"; the ear (but not each grain separately) covered with a husk, the grain precisely like some varieties of maize, only smaller and harder. If this statement be true, and it was made very positively, it is the only wild *Zea* I know of, and the only wild plant that may be a possible progenitor of the cultivated maize.

Other material for history can be found in nearly all the early voyager's relations. In De Soto's march of invasion, *maes* is continually mentioned as cultivated in quantity, and is said to resemble millet. In the unfortunate expedition of Narvaez, still earlier, Carbeça de Vega, found it generally cultivated even into the arid regions of New Mexico(?), Texas, Mexico, etc. In Brazil, in 1647, Nieuhoff speaks of it as "Turkey wheat," called maiz by the Indians, etc. In Jamaica, Lunan confounds it with Guinea corn. In 1665, white and red varieties were "in good plenty," about Batavia. We have it from good testimony that fossil corn has been found in Texas, the grains resembling our modern varieties. In the Illinois Hort. Soc. Trans., 1876, it is asserted by a Mr. Spitz, that he had found in working a stone quarry near La Prairie, Adams county, Ill., both stalks and ears of corn of full size and perfect in appearance, in a petrified condition, and imbedded in a strata of sandstone four feet in thickness, and that it was just like our Indian corn, etc. In Illinois, corn is mentioned by Marquette in 1673; Allonez in 1676; and Membre in 1679, as cultivated by the Indians. In 1553, Peter Cieca, in his "Chronicle," speaks of maize being cultivated about Quito, Peru.

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