THE AMERICAN PLANT MIGRATION

PART I: THE POTATO

BY

BERTHOLD LAUFER

LATE CURATOR, DEPARTMENT OF ANTHROPOLOGY

PREPARED FOR PUBLICATION

BY

C. MARTIN WILBUR

CURATOR, CHINESE ARCHAEOLOGY AND ETHNOLOGY

ANTHROPOLOGICAL SERIES

FIELD MUSEUM OF NATURAL HISTORY

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DR. BERTHOLD LAUFER, 1874–1934

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FOREWORD

After the death of Dr. Berthold Laufer in September, 1934,[1] a few unfinished manuscripts and thousands of miscellaneous notes were found in his office. These manuscripts can be grouped under four headings: domesticated animals, Tibet, games, and the world diffusion of native American cultivated plants. Only a few scattered notes on jade were found. Most of this material probably can never be published. However, about seven or eight of the manuscripts, all dealing with cultivated plants, are so nearly complete that it may be a relatively easy task to publish them.

Study of those cultivated plants and domesticated animals which made civilization possible was one of the primary interests of Dr. Laufer. In particular, that complex of economic plants which spread all over the globe from America captured his imagination, since he was a profound student of the cultural history of the world. For more than thirty years he collected materials on this vast subject. He presented the problem in general outline in 1929 in his brilliant article, "The American Plant Migration" (Laufer, 1929). It should be emphasized that he approached the whole question as an aspect of world history, as a dynamic in civilization, not from the viewpoint of a botanist.

It appears that Dr. Laufer had projected a series of monographs to discuss individual American cultivated plants and the history of their diffusion. Together these monographs would have composed several volumes. Death terminated this plan.

Fortunately, a number of sections of his proposed volumes on the American plant migration are nearly complete; the present monograph is one of these.

The plan for the present volume, of which this is the first part, is to publish such of the work as appears, from internal evidence, to be nearly finished. This can only approximate—it cannot duplicate —the work as it might have been done by Dr. Laufer.

I do not know why Dr. Laufer failed to publish the results of these long researches. Possibly he felt that more work on these subjects needed to be done; possibly he was too pressed with administrative duties. The latter cause was probably the important one. Perhaps by publishing this manuscript, and others to come, an injustice is committed to Dr. Laufer's ability and his passion for perfection.

[1] For obituary and complete bibliography, see American Anthropologist, n.s., vol. 38, 1936, pp. 101–111.

But whatever prevented prior publication (and granting that he would not consider this series finished), I feel that it is better to publish these imperfect notes than to shelve them and thereby allow them to benefit no one.

In 1936 Mr. C. Martin Wilbur was appointed Curator of Chinese Archaeology and Ethnology at Field Museum. His first task was to sort and classify Dr. Laufer's notes and manuscripts. Every effort was made to see that no copy might be overlooked.

After many weeks of work, Curator Wilbur submitted to me a memorandum concerning the status of these documents and stated that he was ready to prepare for publication the one most nearly complete: *The Potato.*

Mr. Wilbur undertook this gratuitous assignment with buoyancy and patience. He has conscientiously followed the form and content of Dr. Laufer's manuscript; he has spent nearly five months supplying a complete bibliography, checking all quotations, changing the system of notes and references to conform to present usage in this Department, translating certain passages from the Chinese, and writing from rough notes the chapter on the Malayan and Oceanic regions.

There has been little attempt to amplify the information or to scrutinize critically all the texts cited and the problems raised. All references and quotations, however, were checked against the original works when these were available. If various regions are disproportionately treated, it is because Dr. Laufer handled them so. Except for the bibliography, and the chapter treating the Malayan and Oceanic regions, all matter supplied by Mr. Wilbur has been printed within brackets and preceded by an asterisk.

Generous assistance was rendered by Dr. L. C. Goodrich of Columbia University, Dr. A. W. Hummel and Dr. Shio Sakanishi of the Library of Congress, and Mr. Eugene V. Prostov, University of Iowa. Dr. James R. Ware of Harvard University kindly supplied from the font of the Harvard–Yenching Institute certain missing Chinese and Japanese type. There is no complete record of the many scholars who assisted Dr. Laufer through three decades in assembling and interpreting his material. It is hoped that publication of this work, in which many details of their aid are anonymously assembled, will gratify them.

Perhaps this brief explanation will answer some natural inquiries concerning the condition of Dr. Laufer's manuscripts.

June 1, 1937 PAUL S. MARTIN

Chief Curator, Department of Anthropology

THE AMERICAN PLANT MIGRATION

PART I: THE POTATO

INTRODUCTION

The potato forms one of the most interesting chapters in the annals of mankind. It has had many various fortunes in its long career and world-wide distribution; but from the beginning to the present it has remained a democratic plant—in opposition to the pineapple, which started its career as an aristocrat, a favorite of kings, but which (thanks to the efforts of the canning industry) is now democratized. First misjudged, despised, and ostracized in Europe—even persecuted on account of its nightshade affinity, and maliciously slandered for its alleged poisonous properties—the potato remained for a long time the sustenance of the poor only. Yet during the last century and a half it has conquered all classes of society in both Europe and North America. It is now a fundamental of the white man's civilization; like bread, it is a prime necessity and mainstay of his daily life, an indispensable article in his home.

In one respect it was lucky: its American ancestry has never been called into question. As yet no one has tried to prove its African or Chinese origin. In Africa it is of no importance to the natives; in China as well as in Japan it holds an inferior position. The same holds good for the Near East, the Malay Archipelago, Melanesia, and Polynesia with the sole exception of New Zealand, where it has been able to transform the economic life of the Maori. Spain and Portugal remained sadly inactive in propagating the plant. Spain merely served as a stepping-stone and a way of transit from Peru to Italy. The Spaniards, although the first discoverers of the useful tuber, were slow in recognizing its nutritive value and woke up to the knowledge of its importance at a later time than any other European nation; all they did was confined to the transplantation of the tuber to the Philippines. The Portuguese may have brought it to India, but whatever importance it may have gained there is due to British initiative and energy. It followed the British as well as the Hollanders into their colonies. Clusius and Parmentier are the two brilliant names standing out in the history of science as students and propagators of the plant in Europe.

An illustration of Peruvian potato varieties inserted *[fig. 10, p. 96], in the March number of the *Journal of Heredity* of 1925,

is accompanied by this legend: "The potato is the most valuable of the gifts that the ancient Peruvians made to the agriculture of the world. One year's potato crop amounts to from four to six billion bushels, which represents in money value probably far more than the treasure taken from Peru at the time of the conquest. In spite of this, the potato is not an unmixed blessing, for by making possible a greatly increased population in northern Europe it is to be regarded as one of the contributing causes of the World War." Poor potato! It was not enough to brand it with the stigma of lacking Biblical authority, causing leprosy, spreading poison and disease, and ruining the soil; now it must also bear responsibility for a war. True it is that the potato is somewhat revolutionary in character, inasmuch as it has engineered an economic revolution in human and animal nutrition and to a remarkable degree has lessened the dangers ensuing from famines. In this manner it has largely contributed to the saving and preservation of human lives, perhaps even to the increase of population; yet the role of a life-saver is by no means ignominious. The factors which tend to increase the population of a country cannot be laid at the door of this or that plant, but are complex and organically interrelated: improved conditions of housing and sanitation, the progress of medicine and hygiene, superior standards of living, amelioration of wages and labor conditions, rapidity of progress in commerce, industries, and agriculture, number of marriages, etc., are all contributing or concomitant factors. If it is true that overpopulation has a tendency to cause wars, it is certainly not fair to blame a war on just one of the numerous causes which go to make for overpopulation.

A French naturalist, l'Abbé Armand David (vol. 1, p. 181) has observed that maize and potatoes, both novel to China, have allowed the Chinese to live in the gorges of the high mountains; he is disposed to think that what takes place in China may occur in many other mountainous regions of the temperate and subtropical zones, and he concludes that, consequently, in ancient times our earth was never populated so densely as it has been since the acquisition of these two alimentary resources.

The variability of the potato is stupendous. The varieties have increased by leaps and bounds. Culture, so to speak, creates new varieties almost daily. While about a thousand are known at present, sixty were known in France in 1815, 493 in 1855, and 528 in 1862. The degree of variability has doubtless increased with the intensity of culture, which simultaneously improved quality. The

general aversion to the potato in the time of its initial cultivation in Europe may have been due partially to inferior or undeveloped specimens, partially to lack of understanding of its cultivation and preparation. The superior quality of our present potatoes is the outcome of long-continued selection and improved methods of cultivation. There can be no doubt that several varieties existed in the Inca empire as the result of the achievements of Peruvian agriculture. This is still demonstrated by the many varieties grown by the natives of Peru, illustrations of which are given by O. F. Cook (1925, pp. 96, 109). The tubers show a wide range of variety as to shape, size, color, and texture; some varieties are deep purple under the skin, and others purple throughout. The natives of the tableland districts plant many varieties together, but know the names and qualities of the different kinds. In general, the color varies from pale gray to yellow, red, violet, and even black; the size, from that of a nut to that of a small melon.

No less admirable is the adaptability of the plant to climate, altitudes, and soils. It lives at an elevation of 12,000 and even 14,000 feet,[1] yet also flourishes in coastal areas. It thrives in sandy soil and at elevations where cereals do not grow. The tubers can be preserved easily and for a long time.

[1] The cultivation of potatoes is carried to an altitude of more than 14,000 feet on the southern slope of the valley in the district between Santa Rosa and Araranca (Cook, 1920, p. 489).

BOTANICAL ORIGIN OF THE POTATO

The distribution of the tuber-bearing species of *Solanum*, according to J. G. Baker (pp. 489–503), is as follows:

Chile: *Solanum tuberosum, S. etuberosum, S. fernandezianum, S. Maglia, S. collinum.*

Brazil, Uruguay, and Argentina: *Solanum Commersonii.*

Peru, Bolivia, Ecuador, and Colombia: *Solanum tuberosum, S. immite, S. colombianum, S. Valenzuelae.*

Mexico: *Solanum verrucosum, S. suaveolens, S. stoloniferum, S. utile, S. demissum, S. squamulosum, S. cardiophyllum, S. oxycarpum.*

Southwest United States: *Solanum Fendleri, S. Jamesii.*[1]

All tuber-bearing species of *Solanum* occur in America, and this fact alone is sufficient to suggest that *Solanum tuberosum* is an American cultivation. *Solanum tuberosum* is the only one of these species that has been brought into cultivation and is known exclusively in the cultivated state.

In regard to the descent of our cultivated potato, Henry Phillips (vol. 2, p. 91) already by 1822 entertained sensible views when he

[1] *[Eugene V. Prostov of the University of Iowa has generously contributed supplementary data which summarize the conclusions of modern Russians on the botanical origin of the potato in South America. This information, of very recent date, conflicts in certain respects with Dr. Laufer's earlier conclusions (see footnotes, pp. 13, 14).

A totally new revision of the systematic botany of potatoes was published by S. M. Bukasov of the Leningrad Academy of Agricultural Sciences in 1923, and included a guide to the description of varieties, based on characters such as dissection of the leaf (Crowther, p. 272). This was subsequently proved valid by the cytological analysis of South American varieties collected by the Russian expeditions of the U.S.S.R. Academy of Agricultural Sciences, 1925–32. Vavilov (p. 55) enumerates the following varieties as indigenous to their localities (cf. Fig. 1).

I. Basic endemic domesticated varieties of the highland regions (*punas* and *sierras*) of the South American center of origin of cultivated plants:

Solanum andigenum Juz. et Buk., the most widespread potato of the area between Bolivia and Central America. 48 chromosomes.

Solanum cuencanum and *S. Kesselbrenneri:* Ecuador. *S. Ajanhuiri* and *S. pauciflorum:* Bolivia. *S. stenotomum:* Bolivia, Peru, and Ecuador. *S. goniocalyx:* Peru. *S. Rybinii* and *S. bayacense:* Colombia. 24 chromosomes (J. & B.).

Solanum Juzepczukii Buk. and *S. tenuifilamentum:* Peru and Bolivia. *S. mamilliferum:* Peru. *S. Chocclo:* Peru, Bolivia, Ecuador. *S. riobambense:* Ecuador. 36 chromosomes (J. & B.).

Solanum curtilobum: Peru and Bolivia. 60 chromosomes (J. & B.).

II. Endemic varieties of the un-irrigated subtropical and tropical regions of Ecuador, Peru, and Bolivia (ecologically known as *ceja, yunga, montaña*):

Solanum phureja Juz. et Buk.: Bolivia. 24 chromosomes.

III. Chiloe Island, center of origin:

Solanum tuberosum. 48 chromosomes.]

observed: "We conclude that all the varieties of the potatoe which we now enjoy, have originated from one kind, and that they have in a great measure changed their nature by cultivation. From the seed, there is a great chance of procuring a new variety; but that produced from the eyes of the root seldom changes from the kind planted."

This opinion is confirmed by the intensive research of Wittmack, whose more important results may be summed up as follows *[pp. 604–605]: The potato is derived from only a single species, *Solanum tuberosum*, the home of which is in the Andes of South and Central America. *S. tuberosum* is a *good* species which since its introduction has scarcely changed at all in its flowery parts. It is divided into several subspecies which, however, vary merely in unessential characteristics—for instance, *S. immite, Mandoni, verrucosum, utile, Fendleri*, etc. Also *S. etuberosum* hort. Edinburg (non Lindley) belongs to this group. If these subspecies are to be regarded as species for the sake of convenience of nomenclature, *S. tuberosum* itself is a total species (*Gesamtart*). Crossings with *S. Maglia* seem to have occurred only to a small extent. *S. Maglia* represents a species of its own whose habitat is on the coasts of Chile and Peru. It has probably not been cultivated by the aborigines. *Solanum Commersonii*, which is found along the eastern littoral of temperate South America, throughout Argentina, as well as in Mexico and Arizona (*S. Jamesii*), bears no relation to our potatoes hitherto cultivated. According to Wittmack, it is not necessary to explain *S. tuberosum*, as has been done, as being developed from accidental or volitional crossings of different species. The ancient inhabitants of Chile and Peru did not cultivate a bitter tuber until it changed into an edible food plant, but they selected a species of *Solanum* which had edible tubers. Heckel's hypothesis *[pp. 117 ff.] that it was *Solanum Commersonii* and *S. Maglia* which were first introduced into Europe, is not valid: the first descriptions and illustrations of the potato in European literature—those by Clusius and Gerard—plainly refer to *Solanum tuberosum* and nought else. Heckel specialized on *Solanum Commersonii*, and, with the bias of the specialist, soon saw his pet species everywhere—in Hariot's *openauk* of Virginia and in Gerard's potatoes of Virginia—which is a very deplorable error.[1]

[1] *[The most recent students of the potato, N. I. Vavilov (p. 58) and S. M. Bukasov, agree with Wittmack as to the undivided parenthood of *S. tuberosum:* "The ordinary potato, *Solanum tuberosum*, was first borrowed by the Europeans from the Chiloean Indians. *S. tuberosum* is very near morphologically to *S. andigenum*, both varieties having 48 chromosomes, but the former, with its ability to bear long periods of daylight, is particularly well adapted to the European conditions. Most of the Peruvian, Bolivian, and Ecuadorian varieties of potato,

According to W. E. Safford (1925, pp. 229–230), "Numerous species of tuber-bearing Solanums have been collected in various parts of America both north and south of the equator, but *Solanum tuberosum* itself has never been found in its wild state. Evidence as to the place of its origin points to the central Andean region where conditions of soil and climate are such that a number of plants of other families have developed tubers of a similar nature."[1] Dr. Safford refers *[p. 225] to the efforts of G. Bitter, W. F. Wight, and P. A. Rydberg to determine the origin of the potato. Bitter says: "We do not even know whether it proceeded from a single species which has greatly varied under cultivation or whether it resulted from hybridization of several allied species. That certain characters of our cultivated potatoes should be attributed to selection of the best tuber-bearing varieties through a long period of

while of great interest to the plant breeders, require short summer days for normal development of tubers, and do not succeed in forming tubers under ordinary European conditions."

According to Bukasov (1933, p. 426), *S. tuberosum*, characterized by its high fertility, and by its vulnerability to the phytophthora, is also raised on the coast of Chile, and on the low plains between the hill chains of Araucania, by the Araucano Indians. It was exported from here to Europe three hundred years ago. In the middle of the nineteenth century, when an epidemic of phytophthora threatened to destroy potato culture in Europe, and it was discovered that the European potato hybrids, evolved on the basis of the original two or three sorts, were not able to cope with the contingency, the American plant breeder Goodrich decided to infuse new blood into the potato species, and secured several new varieties of potatoes from Chile. Hundreds of new varieties resulted from this infusion.]

[1] *[Many domesticated varieties of tuber-producing *Solanum*, other than *S. tuberosum*, were discovered by the expeditions to South America dispatched by the Institute of Plant Industry of the U. S. S. R. Academy of Agricultural Sciences, 1925–32. According to Vavilov (p. 58) practically untouched reserves of cultivated plants and wild and cultivated potatoes particularly, were discovered in the highland areas of Peru, Bolivia, and Ecuador. These regions are rich in endemic varieties of potatoes and of other cultivated tubers, known only in this part of the world. The cultivated endemic varieties of plants, as well as of animals such as llamas and alpacas, are concentrated mainly in the *puna*, highland plains situated at altitudes ranging from 3,500 to 4,300 meters above sea level. This culture is not artificially irrigated. It is still possible to follow the transition between the cultivated and the wild plants. There is no doubt that both the agriculture and the animal husbandry in South America had their beginning in the *puna*. The localization of the endemic plant and animal varieties here is amazingly sharp.

The coastal regions of Peru, which had not been well populated until the time of the Inca civilization, sharply differ ecologically from the highlands. The desert-like character of the area requires artificial irrigation. Like the agriculture of Egypt, the remarkable agriculture of the Incas was doubtlessly not indigenous. Both the Egyptian and the Incan cultures were based on artificial irrigation. Until the arrival of the agriculturist, the coastal area of Peru did not have any of the wild prototypes of domesticated forms and did not have either corn or cotton. Most of the plants here were borrowed from Central America and partly from the eastern slopes of the Cordilleras.

According to Bukasov (1933, p. 17) the area of potato cultivation in South America extends north from 40° south latitude almost to the Tropic of Cancer across the Equator—a matter of sixty degrees of latitude—and from the coastal

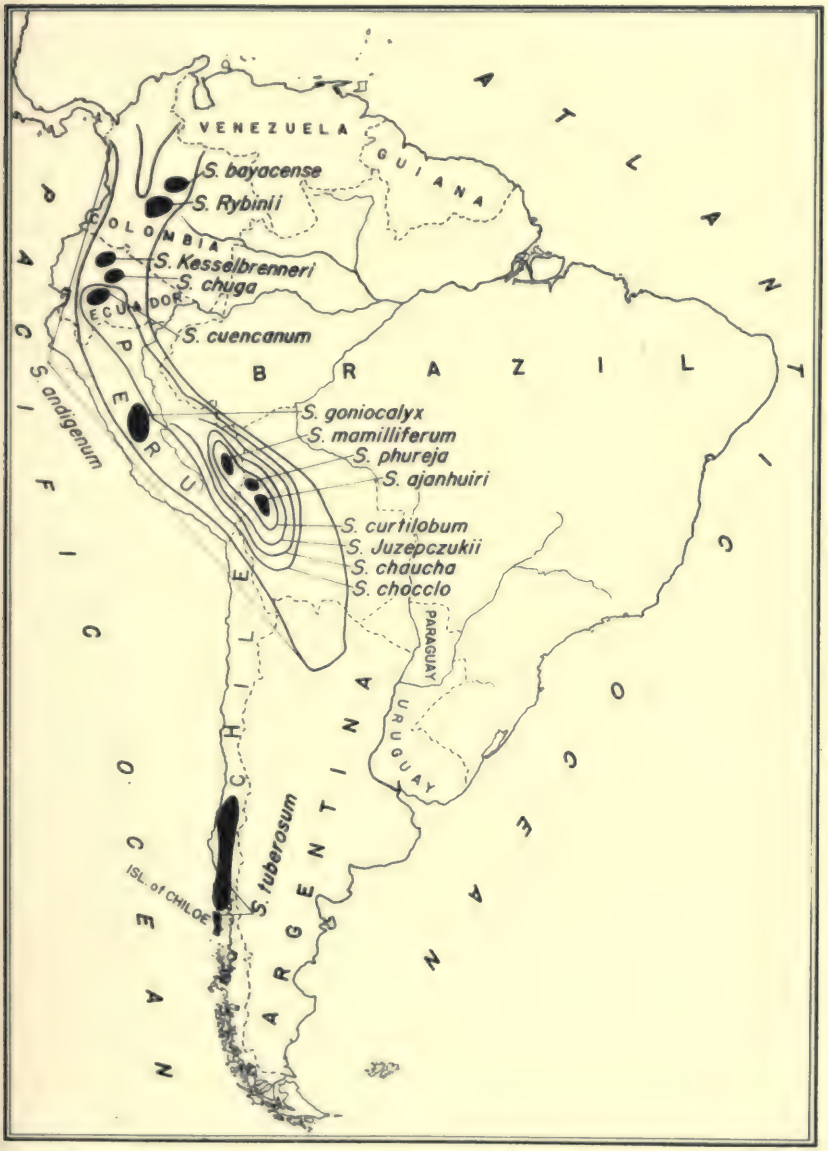

FIG. 1. Distribution of potato varieties cultivated by South American Indians. (After Bukasov.)

cultivation in situations differing from one another in soil and climate, there can be no doubt. New varieties are constantly appearing, produced by horticulturists through a process of cross-pollination and selection, in the same manner as many other cultivated plants." *[Safford, 1925, p. 226.] Experiments are now being made by investigators in cross-pollinating distinct wild species with one another and with the cultivated potato, which may result in types resembling the original form of the ancestor or ancestors of the potato.

Solanum Commersonii was discovered in 1767 by Philibert Commerson (1729–73; P. Oliver, 1909), companion of Bougainville on his voyage around the world (1762–69), at the mouth of the La Plata near Montevideo, and was named for him by Dunal. The species was three times introduced into France. It has also been

zone of the Pacific, at sea level, almost to the snow line, at an altitude of 4,100 meters above sea level. Frosts are constant at the extremely mountainous area; yet the varieties of potatoes cultivated there are not affected by frost. Other varieties of potatoes are cultivated in the torrid mountain valleys side by side with cotton. The annual precipitation in the area of potato cultivation varies from abundant, more than 2,000 mm., to scanty, 200 mm., necessitating artificial irrigation.

Of particular interest is the fact that the artificial irrigation of potato fields in certain localities has been practiced since time immemorial.

This variety of climatic conditions in regions widely separated by some of the most arid deserts and salt plains, tropical forests, inaccessible mountain ranges, and broad valleys on unnavigable rapid rivers, tended to create the conditions which led to the development of many widely differing and very original types of cultivated potato: frost-resisting, fast-sprouting, early, and exceptionally late (requiring short days to form tubers), and many other varieties.

Bukasov (1933, pp. 38–41) enumerates the following cultivated varieties of potatoes which have attracted the attention of Soviet plant breeders:

Solanum andigenum is the most widely spread domesticated potato growing in the Andes. Its many varieties grow at altitudes ranging from 2,000 to 4,100 meters above sea level, in the mountainous section of Argentina, in Bolivia, Peru, Ecuador, and Colombia, reaching as far north as Guatemala and Mexico. This is an exceptionally fecund variety easily crossed with *S. tuberosum*. It is widely grown in the experimental stations throughout Russia.

S. curtilobum (*china malco*) is another cultivated potato grown by the Indians of Peru and Bolivia. It is characterized by resistance to cold and by high starch content.

S. Juzepczukii and *S. Ajanhuiri*, cultivated frost-resisting mountain varieties of Peru and Bolivia, used in the making of *chuño*.

S. Rybinii, *S. bayacense*, both domesticated mountain potatoes of Colombia; *S. Kesselbrenneri*, *S. Chuga* (*chaucha chuga*), and *S. phureja* from Ecuador are all early varieties. The hybrids of *S. Rybinii* are now commercially grown in the extreme north of European Russia, in Murmansk. *S. phureja* grows in warm mountain valleys, at lower altitudes than the rest of the mountain potatoes.

Many new wild varieties of potato were collected by Bukasov and Iwzepozuk. According to Bukasov (1933, pp. 26–28, 33–35) wild potatoes grow throughout the southern half of South America below the tropics, from the Pacific to the Atlantic, in the mountains and in subtropical valleys. In North America, they

cultivated in Germany, without attracting much notice (Wittmack, p. 570). In southern Brazil, Uruguay, and Argentina it is widely diffused. This geographical fact goes to show also that the cultivated potato cannot be derived from this species, for the ancient culture-zone of the potato is along the west coast of South America, not in its eastern part.

Solanum Maglia was thus named by Schlechtendahl, *maglia* being the Italian spelling for Spanish *malla*, which itself is an Indian name for this wild tuber-bearing species. This is the species found by Darwin in 1835 in the islands of the Chonos Archipelago, southern Chile, where it occurred in abundance near the beach, and was for a long time taken for a wild form of *Solanum tuberosum* (Safford, 1925, p. 225). *Solanum Maglia* was first cultivated in London in 1822

grow throughout Mexico, reaching into the southwest of the United States. More varieties of wild potato are known in Mexico than in any of the South American countries rich in potatoes. . . .

More than a hundred varieties of wild potato are known, thriving under a great variety of conditions. As weeds, they grow in the potato and corn fields, near Indian huts, at the roadsides, on the trash heaps and in pastures. The wild potato grows in shady forests, on torrid rainless ocean shores, and in the mountains to an altitude of almost 5,000 meters, the snow line, where it withstands great frosts. The properties of different varieties of the wild potato differ accordingly, and many of them may be of great economic value.

The basic differences between the wild and the primitive domesticated varieties of South America are explained by Bukasov (1936, p. 36) as due to the very process through which the potato was adopted by the primitive culture. In the course of selection the varieties adopted for cultivation were chosen with a view to the yield of the crop as much as to its quality. The varieties so chosen were characterized by larger tubers and more compact nests. The rejected varieties were characterized by smaller tubers, rarely larger than a walnut, with long pedicels, sometimes a meter in length.

Wild potatoes, described by Bukasov (1933, pp. 28–35), vary greatly in outward appearance. Some of them resemble tomato plants. Others look like dock weed (*Rumex crispus*, etc.).

Solanum Vavilovii from Peru grows in arid, droughty hills, where short-lived vegetation thrives on moisture from mists, and potatoes are not raised.

S. demissum is a wild potato of the Mexican highlands, growing at an altitude of 2,000 to 3,000 meters above sea level, sometimes as a weed in corn patches. It has very small tubers, but because of its frost-resisting properties, it has been studied by Russian and German potato breeders. The plant is lower than the ordinary potato, and is distinguished by abundant flowers.

S. Antipoviczii is another wild potato from the mountains of Mexico. It has been studied by Russian plant-breeders because of its disease-resisting properties. The plant is as tall as the ordinary potato, has sparse leaves, small flowers, and small tubers on very long pedicels.

S. acaule is the wild potato of the mountains of Peru, Bolivia, and Argentina. It thrives at altitudes from 4,000 to 5,000 meters, reaching almost to the snow line, and withstands the frosts of −8° C. It grows in the scant mountain pastures, and in the crevices of stone fences. This potato has no stem, its leaves lying flat on the ground and protecting its berries. Its tubers are very small and widely scattered. It has attracted much attention in Russia, where it is expected to be useful in evolving a hardy domesticated variety for cold regions. Its cultivated hybrid, *S. Juzepczukii*, is used for the manufacturing of *chuño*.]

(Sabine, p. 254, and plate IX). It never obtained any importance in Europe, and A. Sutton reported in 1908 to the Linnean Society that the crossings of *S. Maglia* with *S. tuberosum* had almost all failed, especially as the flowers of *S. Maglia* fall off easily. This fact proves sufficiently that this species had no share in the cultivation of *S. tuberosum*. *S. Maglia* is restricted to the littoral, whereas the home of *S. tuberosum* is in the mountains. *S. Maglia* commonly grows wild in Chile, where it forms the chief article of food among the Araucanos. In modern times they have also cultivated *S. tuberosum* (Latcham, pp. 340–341). De Humboldt's theory (pp. 400–401) that *S. Maglia* is the mother plant of the cultivated potato disseminated from Chile to Peru and as far as the highlands of Bogotá, is erroneous. Peru probably is the home of the cultivated potato.

EARLY HISTORY OF THE POTATO IN SOUTH AMERICA

At the time of the Spanish conquest of America the cultivation of *Solanum tuberosum* was strictly limited to the Andean region of South America. It was not cultivated and not found anywhere at that time in the Antilles, in Mexico or Central America, in North America, or in the central and eastern portions of South America. All statements to the contrary are erroneous, being prompted by misunderstandings and confusions with other species like the batata or sweet potato,[1] *Apios tuberosa*, and wild-growing species of *Solanum*. The subsequent propagation of *S. tuberosum* from its original home on the west coast of South America to other parts of the continent is not due to Indian agency, but to the activity of the white man. It is notable also that while other cultivated plants of South America spread rapidly northward after the conquest, the potato moved at a comparatively slow pace.

The first documentary evidence for the existence of *Solanum tuberosum* is presented by the account of Pedro Cieza de León, who in 1538 encountered it in the upper Cauca Valley between Popayan and Pasto, in what is now Colombia. Subsequently he found it at Quito, the present capital of Ecuador. In his journal, entitled *Chronica del Peru*, he describes what the aborigines call *papas* as "a kind of earth-nut, which, after it has been boiled, is as tender as a cooked chestnut, but it has no more skin than a truffle, and it grows under the earth in the same way." *[Markham, 1864, p. 143.] In writing of the elevated Collao region in Peru, he speaks of it thus: This country of the Collao was once very populous, and was covered with large villages round which the Indians had their fields, where they raised crops for food. "Their principal sustenance is *papas*, which as I have already stated in this history are like *turmas de tierra*. These they dry in the sun and keep from one harvest to the other. And they call this *papa* after it is dried, *chuno* [*chuñu*]; and among them it is esteemed and held precious: for they have no ditches like many others in this kingdom to irrigate their fields; and if there is a dearth of natural water to make their crops grow they suffer from lack of food and work, unless they are provided with this sustenance of dried *papas*. And many Spaniards have become rich and returned to Spain prosperous only from carrying *chuno* to sell

[1] The potato is not indicated among the vegetable products of the coast of Honduras or involved in the terms *ages* and *battatas* of Peter Martyr, as asserted by G. Ord (p. 157); this is the sweet potato.

to the mines of Potosi." (Safford, 1925, p. 179; cf. also Markham, 1864, pp. 360–361.)

Markham annotates that "frozen potatoes are still the ordinary food of the natives of the Collao. They dam up square shallow pools by the sides of streams, and fill them with potatoes during the cold season of June and July. The frost soon converts them into *chuñus*, which are insipid and tasteless." Cieza's account refers to the Chibcha, the ancient inhabitants of Colombia, of whom also Oviedo (Liber XXVI, cap. 23) says that they subsisted principally on maize and potatoes, called in their language *yoma*.

José de Acosta, who was in South America from 1571 to 1576, describes *papas* in the old English translation thus (Markham, 1880, p. 233): "These rootes are like to ground nuttes, they are small rootes, which cast out many leaves. They gather this *Papas*, and dry it well in the Sunne, then beating it they make that which they call *Chuñu*, which keeps many daies, and serves for bread. In this realme there is great trafficke of *Chuñu*, the which they carry to the mines of Potosi; they likewise eat of these *Papas* boyled or roasted." W. E. Safford (1925, pp. 179–180) gives a fuller version, translated from the Spanish text: " 'In the elevated region of the Sierra of Peru and the provinces which they call the Collao, composing the greater part of that kingdom, where the climate is so cold and dry that it will not permit the cultivation of wheat or maize, the Indians use another kind of roots which they call *pappas*, a kind of *turmas de tierra* that send up scant foliage (*echan arriba una poquilla hoja*). These *pappas* they collect and leave in the sun to dry well, and breaking them they make what they call *chunyo* which will keep for food in that form many days and serves them for bread; and of this *chunyo* there is great commerce in that kingdom with the mines of Potosi. *Pappas* are also eaten fresh either boiled or roasted; and from one of the mildest varieties which also grows in warm situations they make a certain ragout or *cazuela* which they call *locro*. Indeed, these roots are the only wealth of that land, and when the season is favorable for the crop they [the Indians] are glad; for many years the roots are spoiled and frozen in the ground, so great is the cold and bad climate of that region.'

"In preparing *chunyo*, potatoes were subjected to freezing as well as drying. The process is described in detail by Padre Bernabé Cobo [vol. 1, p. 361], who writes as follows: 'The tubers are gathered at the beginning of the cold season, in May or June, spread on the ground and exposed, for a period of twelve or fifteen days, to the sun during

the day and the frost at night. At the end of this time they are somewhat shriveled, but still watery. In order to get rid of the water they are then trampled upon and then left for fifteen or twenty days longer to the action of the sun and frost, at length becoming as dry and light as a cork, very dense and hard, and so reduced in bulk that from four or five fanegas of fresh tubers there results only one fanega of *chunyo*.' Cobo adds that *chunyo*, thus prepared, will remain unspoiled for many years and that the Indians of the Collao provinces eat no other kind of bread. A choicer and more highly prized quality is prepared by soaking the tubers in water for about two months, after their preliminary drying. They are then taken out and dried in the sun once more. This quality of *chunyo*, which is chalky white within, is called *moray*. From it a kind of flour, finer than wheat flour, is prepared by the Spanish women, who use it for starch, biscuit, and sweetmeats of all kinds, like those confections usually made with sugar and almonds."

G. Benzoni (p. 249) writes that the natives of Peru have a sort of root like truffles, but possessing very little flavor.

Size, shape, and color of potatoes depend much on the composition and fertility of the soil, and upon weather, climate, care, etc. This was well known to the Inca. According to the Jesuit P. Morúa, the Inca Urko, a member of the royal family, a famed engineer and architect, to whom the construction of the fortress of Cuzco is also ascribed, had the best potato soil carried from Quito to Cuzco and made into the hill Al'pa suntu ("Earth-Hill") east of the fortress, and there the potatoes were grown for the ruling Inca (von Tschudi, p. 112).

In the worship of the ancient Peruvians the *papa* played a certain, though inferior, role. At times the female fortune-tellers placed heaps of potatoes before them and took the tubers up by pairs; if none was left, they predicted a favorable year; if one was left, however, the year was unlucky. The Kol'a styled this mode of divination *piu irute* ("potato-counting"). (*Ibid.*, p. 113.)

In a Peruvian prayer addressed to the Creator, it is said: "Thou who givest life to all things, and hast made men that they may live, and eat, and multiply. Multiply also the fruits of the earth, the *papas* and maize (*papa-sara*) that thou hast made, that men may not suffer from hunger and misery. Preserve the fruits of the earth from frost, and keep us in peace and safety." (C. de Molina, in Markham, 1872, p. 30.)

There were two ways of preserving potatoes: (1) They were peeled and then exposed to the cold for several nights and dried in the sun during the day. This process was repeated as many times as necessary; thus prepared, the tubers were stored in a dry place and kept for years. (2) Another method was to freeze the potatoes for several nights and to dry them in the sun during the day. Then they were pressed with the feet and again exposed to the sun and frost; when dry and without moisture, they were preserved. In this state they were shriveled and small, of gray black color, and, when boiled, made a slimy pap of bad taste (von Tschudi, pp. 113–114).

In the higher elevations of Peru, where maize does not thrive, living was rendered possible only by the potato. In Cuzco, potato-farming is carried on throughout the country from 12,000 feet above sea level upwards to nearly 15,000 feet (Hardy, p. 1).

The accounts of the Spanish authors did not fail to attract attention among the scholars of Europe. Girolamo Cardano (1501–76) summed up the subject as follows: "In Colla or the country of Peru, the *papa* is a genus of tuber, utilized like a kind of bread and generated in the soil; thus nature everywhere cares wisely for all necessaries. The *papas* are dried and then called *ciuno*. Some people found means to profit from transporting only this article into the province Potosi. They say that this root bears an herb similar to that of the Argemone. They are shaped like chestnuts, but have a more agreeable taste: they are eaten cooked or made into meal. They are likewise found among other peoples of this Chersonesos, as well as among the inhabitants of the province of Quito."[1] Cardano is the first Italian author and the first in Europe who speaks of the potato on the basis of Spanish accounts, without knowing the plant, which had not yet been introduced into Italy at the time he wrote (1557).

Fortunately there is also archaeological evidence testifying to the great antiquity of the potato in Peru. This evidence comes to us in a twofold form—plant remains and reproductions of the tuber in ancient pottery. Dried potatoes were discovered by Dr. Safford in 1887 in graves at Arica, on the coast of northern Chile, together with arrow points and llama-drivers' slings from the elevated plateau about Lake Titicaca (Safford, 1925, p. 178).

[1] In Colla autem regione Peru, papa est tuberis genus, quo pro pane utuntur, gigniturque in terra: ita natura providit sapienter ubique: siccantur, vocanturque ciuno: factique quidam sunt divites hac sola merce, quam in provinciam Potossi, deducebant. Fert tamen, ut dicunt, radix haec herbam argemone similem: forma est castaneae, sed suavior gustu, editurque cocta, vel, ut dixi, in farinam redacta. Invenitur etiam apud alias gentes eiusdem Chersonessi, velut apud accolas provinciae Quiti. *[Cardano, p. 16.]

a *b* *c*

FIG. 2. Potato-form vessels from Chimbote, Peru, now in Field Museum of Natural History. *a* and *c* collected by W. E. Safford in 1892; *b*, a whistling *huaca*.

Two Peruvian pottery vessels in the shape of a potato are illustrated by E. Seler (plate 23, Nos. 1, 2). Dr. Safford has reproduced a vase in the collections of Field Museum from a grave at Chimbote on the coast of northern Peru, found by him in 1892 and shaped in the form of two joined potatoes in their natural colors; a black vase from a Chimbote grave in the form of a conventionalized potato; and a whistling *huaca* of black ware in the form of twin conventionalized potatoes (1925, pp. 176, 177; also 1917). Dr. Safford observes that these vases were most abundant in graves near Chimbote and Chepen, northern Peru, and that they were interred with the dead in pre-Columbian times *[1925, p. 178]. (Cf. Fig. 2.)

Potatoes were also cultivated by the aborigines of southern Chile at an early date. There they were encountered as a food staple of the Indians in 1578 by Sir Francis Drake, according to Safford (1925, p. 180), who observes that their occurrence at sea level in this part of South America is not singular; for, as all students of plant distribution know, many species characteristic of the Andean vegetation thrive at altitudes lower and lower as they extend southward, reaching sea level in the region of the Chonos Archipelago and the Straits of Magellan. Within less than a decade after Drake's visit, potato tubers had become a regular food on Spanish ships. On March 16, 1587, Thomas Cavendish, stopping at St. Mary Island near Concepción in southern Chile, found "Cades full of Potato Rootes, which were very good to eate, ready made up in the Store-houses for the Spaniards, against they should come for their tribute." (Purchas, vol. 2, p. 157.) In my opinion, the center of potato cultivation is to be sought in ancient Peru, and from there the potato spread northward into the territory of Ecuador and Colombia as well as southward into Chile.

The statement has frequently been advanced that the potato occurs spontaneously in Chile, and that there also its cultivation was initiated.[1] From there the cultivated form is supposed to have

[1] I have carefully read the article of A. C. Pinochet, who makes a passionate plea on behalf of Chile exclusively, at the expense of Peru. Pinochet gives a great deal of information on the occurrence of wild *papas* in Chile, without botanical identifications, however (and there is no doubt that several species are here in question), but this has no bearing on the problem of the cultivation of *Solanum tuberosum*. Mexico, for instance, harbors eight wild tuber-bearing species of *Solanum*, compared with five of Chile, but no one, for this reason, seeks for the cradle of *S. tuberosum* in Mexico. No evidence is presented by Pinochet for the antiquity of potato cultivation in Chile, while the evidence in favor of Peru is suppressed. A popular tradition is cited to the effect that the potatoes of Peru

spread to Peru and Bolivia into the empire of the Inca, who largely contributed to its extension. Dr. R. Lenz of Santiago has announced (p. 561) that in the second part of his work, which has not yet appeared, he hopes to demonstrate clearly that the Indians of Chile were skilful agriculturists long before the conquest of the Inca and that by no means do they owe to this invasion the first steps to civilization, as almost all Chilean writers believe. This does not mean that the Peruvians did not independently discover the utility of the *papa* which grows wild everywhere along the Pacific coast. There is no doubt that in no other territory than Chile was the cultivation of the *papa* in pre-Columbian times more extensive and intensive, and it is more than probable that from Chile this tuber has conquered the world. Dr. Lenz is an accomplished scholar who has spent a lifetime in Chile and whose opinions command respect; it will certainly be interesting to study his promised account. For the present I would say that the essential point is to know that what the ancient Chileans cultivated was really *Solanum tuberosum*. The fundamental question is one of species. The term *papa* was extended by the Spaniards to all tuber-bearing species of *Solanum*, and is therefore an unreliable, nay, misleading criterion in an investigation of this character.

According to M. Uhle (pp. 302–303) potato culture was practiced in Venezuela in prehistoric times, but the evidence adduced by him is not convincing; his reference to *Solanum Fendleri*, a wild-growing species which occurs in Venezuela, proves nothing at all. The potato was doubtless introduced into that country by the Spaniards from Peru or Colombia and thrives well only in the higher altitudes, best of all in the *tierra templada* and *fría*. In the beginning of

and Bolivia were brought by the Peruvians into their country, after they had learned the process of cultivation from the aborigines of Chile during the rule of the Incas and had taught these in return the cultivation of maize; from that time there was in Peru the *papa* called *chaucha*, well known in Arauco and Chiloe. *Chaucha* is a Quechua word denoting a precocious kind of potato; *papa* likewise is a word of Quechua origin and was doubtless carried from Peru into Chile. Pinochet is a Chilean patriot who glories in the idea that his country is the home of this tuber which is "the finest conquest made by Europe in the New World"; but patriotism is not a safe guide in historical investigations. C. Pickering (p. 660) ascribes *Solanum tuberosum* to southern Chile, where it grows wild and is collected for food by the natives; carried thence, it becomes an object of cultivation in northern Chile and Peru in the time of the Incas. Sturtevant (p. 545) follows Pickering. De Candolle (p. 53) states that the potato is wild in Chile in a form which is still seen in our cultivated plants, and he doubts that its natural home extends to Peru and New Granada. All previous assertions as to wild forms of *S. tuberosum*, however, are doubtful, and its real ancestor still remains to be traced.

the nineteenth century, German and Dutch seed potatoes were introduced into Venezuela (Bürger, p. 148).

The potato (Portuguese *batata ingleza*) is cultivated on a large scale in all southern states of Brazil and in Minas Geraes, which furnishes the largest quantity, but not sufficient for the general consumption of the country (Corrêa, p. 4).

THE POTATO IN THE WEST INDIES

How and when the potato spread into the West Indies is unknown. It was known in Jamaica to W. Hughes (pp. 12–15) in the latter part of the seventeenth century, and his definition, that "The *Indians*, as also some of the *Blacks* and *Spaniards*, do call them *Papus*, but we *English* call them *Potatoes*," leaves no doubt that he visualizes *Solanum tuberosum*.

Potatoes, then, were largely planted and consumed by the English colonists of Jamaica in the seventeenth century. Says Hughes *[p. 14] on this subject, "They are common and ordinary meat, used for daily food amongst all Planters; neither are they the worse for being common: for I suppose it to be one of the best, most wholesome, and delicious Roots in the world, especially in those parts, which do much exceed *Spanish Potatoes* that we have brought into *England:* they are easie of digestion, agreeing well with all bodies, especially with our hot stomacks when we come there, who may at first eat of them moderately, four or five times a day, without hurt, (as also of some kinde of meat or flesh:) they breed very good nourishment; they corroborate or strengthen exceedingly; they chear the heart, and are provocative of bodily lust."

Hughes also states *[p. 13] that potatoes "grow in many places in *America*, as in all the *Caribbee* Islands that I have been in; namely, *Barbados, Antego, Mevis* or *Nevis, S. Christophers;* as also *Hispaniola, Jamaica*, &c, where they are planted in most Plantations for daily food; the small ones, or pieces, being reserv'd in digging them up, and replanted for encrease."

In 1789, P. Browne (p. 175) stated that great quantities of the Irish potato were annually imported into Jamaica from Lancaster and Ireland, and that the plant was often cultivated in the cooler mountains of the island, but did not thrive so well as many other European vegetables, though frequently raised with such success as to have been sold in large quantities in the public markets. This importation from England and Ireland does not signify, however, that the potato was then introduced into Jamaica for the first time, as Safford (1925, p. 218) is inclined to assume. The indigenous cultivation is emphasized by Browne and was established long before his time.

INTRODUCTION OF THE POTATO INTO NORTH AMERICA

The first volume of the *Transactions* of the Horticultural Society of London, published in 1812, contains an interesting article by Sir Joseph Banks under the title, *An attempt to ascertain the time when the potatoe (Solanum tuberosum) was first introduced into the United Kingdom*, the essential part of which is herewith reproduced. Later writers on the subject have usually drawn on this essay, so that it is a matter of justice to place on record the earliest English investigation of the question, which in its general outlines is fairly correct, but which also contains fundamental errors still to be found in modern books.

"The Potatoe now in use (Solanum tuberosum) was brought to England by the colonists sent out by Sir Walter Raleigh, under the authority of his patent, granted by Queen Elizabeth, 'for discovering and planting new countries, not possessed by christians,' which passed the great seal in 1584. Some of Sir Walter's ships sailed in the same year; others, on board one of which was Thomas Herriot,[1] afterwards known as a mathematician, in 1585; the whole however returned, and probably brought with them the Potatoe, on the 27th July, 1586.

"This Mr. Thomas Herriot, who was probably sent out to examine the country, and report to his employers the nature and produce of its soil, wrote an account of it, which is printed in De Bry's collection of Voyages, Vol. I. In this account, under the article of roots, p. 17, he describes a plant called Openawk: 'These roots,' says he, 'are round, some as large as a walnut, others much larger; they grow in damp soil, many hanging together, as if fixed on ropes; they are good food, either boiled or roasted.'[2]

"Gerard, in his Herball, published 1597, gives a figure of the potatoe, under the name of potatoe of Virginia; and tells us that he received the roots from Virginia, otherwise called Norembega.

"The manuscript minutes of the Royal Society, December 13, 1693, tell us that Sir Robert Southwell, then President, informed the Fellows, at a meeting, that his grandfather brought potatoes into Ireland, who first had them from Sir Walter Raleigh.

"This evidence proves, not unsatisfactorily, that the potatoe was first brought into England, either in the year 1586, or very

[1] *[Cited by Dr. Laufer as Hariot; other spellings are Harriot and Harriott.]

[2] As will be seen from the following investigation, Hariot's *openauk* is a wild root, and bears no relation to the potato.

soon after, and sent from thence to Ireland, without delay, by Sir Robert Southwell's ancestor, where it was cherished and cultivated for food before the good people of England knew its value; for Gerard, who had this plant in his garden, in 1597, recommends the roots to be eaten as a delicate dish, not as a common food.

"It appears, however, that it first came into Europe, at an earlier period, and by a different channel; for Clusius, who at that time resided at Vienna, first received the potatoe in 1598 [*read* 1588], from the governor of Mons, in Hainault, who had procured it the year before from one of the attendants of the Pope's legate, under the name of Taratoufli; and learned from him, that in Italy, where it was then in use, no one certainly knew whether it originally came from Spain, or from America.

"Peter Cieca,[1] in his Chronicle, printed in 1553, tells us, Chap. XL, p. 49, that the inhabitants of Quito, and its vicinity, have, besides Mays, a tuberous root, which they eat, and call Papas; this Clusius guesses to be the plant he received from Flanders, and this conjecture has been confirmed by the accounts of travellers, who have since that period visited the country.

"From these details we may fairly infer, that potatoes were first brought into Europe from the mountainous parts of South America, in the neighborhood of Quito; and, as the Spaniards were the sole possessors of that country, there is little doubt of their having been first carried into Spain, but as it would take some time to introduce them into use in that country, and afterwards to make the Italians so well acquainted with them as to give them a name, there is every reason to believe they had been several years in Europe, before they were sent to Clusius.

"The name of the root, in South America, is Papas, and in Virginia, it was called Openawk;[2] the name of potatoe was therefore evidently applied to it on account of its similarity in appearance to the Battata, or sweet potatoe; and our potatoe appears to have been distinguished from that root by the appellative of potatoe of Virginia, till the year 1640, if not longer."

For a long time the belief was entertained by botanists, even by H. Phillips and A. de Candolle *[p. 46], and as shown above, by J. Banks, that the *openauk*, described by Hariot among the roots of Virginia, was to represent our potato, that Hariot had brought

[1] Pedro Cieza; other spellings are Cieca, Chieca, Chicca, Ciecha.

[2] This is erroneous (see pp. 32 ff.).

his *openauk*-potato to England, and that hence it was received by John Gerard, the first English botanist, who raised the potato and described and illustrated it. This hypothesis is fundamentally wrong; *openauk* is not (nor can it be) the potato; Hariot does not claim that he ever took that plant to England, neither does Gerard mention Hariot's name or the *openauk* in connection with the potato. Hariot's original work bears the title, *A briefe and true report of the new found land of Virginia of the commodities and of the nature and manners of the naturall inhabitants,* and was privately issued in London, early in 1588. In the second part, which treats of *suche commodities as Virginia is knowne to yeelde for victuall and sustenance of mans life, usually fed upon by naturall inhabitants: as also by us during the time of our aboad,* he describes three roots as follows:

"*Openauk* are a kind of roots of round forme, some of the bignes of walnuts, some far greater, which are found in moist and marish grounds growing many together one by another in ropes, or as though they were fastened with a string. Being boiled or sodden they are very good meate.

"*Okeepenauk* are also of round shape, found in dry grounds: some are of the bignes of a mans head. They are to be eaten as they are taken out of the ground, for by reason of their drinesse they will neither roste nor seeth. Their taste is not so good as of the former rootes, notwithstanding for want of bread and sometimes for varietie the inhabitants use to eate them with fish or flesh, and in my judgement they doe as well as the household bread made of rice heere in England.

"*Kaishúcpenauk* a white kind of roots about the bignes of hen egs and nere of that forme: their tast was not so good to our seeming as of the other, and therefore their place and manner of growing not so much cared for by us: the inhabitants notwithstanding used to boile and eate many."

The botanists who have utilized this text (even A. de Candolle) have merely taken into consideration the first of these roots, called *openauk,* but it is perfectly clear that from the viewpoint of the Virginian aborigines three different, but related kinds of root are distinguished; for even one who is not familiar with American languages must be impressed by the fact that the three Virginian names recorded by Hariot have the element *-penauk* in common, and that this term is modified by the prefixes *o-*, *oki-*, and *kaišuk-*,

respectively.[1] C. Bauhin (1620, p. 89; *[1671, p. 90]) identified Hariot's *openauk* with *Solanum tuberosum*, and some modern botanists (Roze, p. 64) have unfortunately followed him.

Bauhin's conclusion was doubtless suggested by Clusius (1601, p. 80) who, speaking of the potatoes called *papas*, adds that the roots styled by the Virginians *openawk* do not seem to be very different from those (quibus non valde absimiles videntur eae radices, quas Virginienses *Openawk* nominant).[2]

Every one must indeed be struck by the statement that the root is said to grow in moist and swampy soils, which certainly does not hold good for *Solanum tuberosum*. Hence E. Heckel (pp. 109–110) has inferred that the question is of "Solanum commersoni Dunal, qui, seul, est de station aquatique ou semi-aquatique, et, dont les stolons très longs, comme du reste dans beaucoup d'autres espèces sauvages tubérifères, sont bien, comme les tubercules, conformes à ceux que j'ai obtenus moi-même pendant cinq années d'essais." It is therefore probable, Heckel concludes *[p. 112], that even before the discovery of America pirates or perhaps commercial navigators had brought the *papas amargas* (the Spanish name of this species) and their wild varieties from South to North America, where it spread in the interior and notably in Virginia.[3] There is not the slightest foundation for this speculation, and it conflicts with the actual facts concerning the introduction of the potato into Virginia, which will be recited below.

Neither Clusius nor De Candolle, nor Roze, nor Heckel, nor Trumbull, however, have perused Hariot's account with open eyes or in a critical spirit.[4] Before speaking of roots, Hariot concludes

[1] B. D. Jackson (p. 179) states that *-penauk* means "tuber," and remarks: "The vocabularies of the Algonkian languages, drawn up about the time of Hariot's visit, are not full enough to help us much; but in a Swedish narrative [which, is not stated by him] we meet with the word Hoppenaes, which may be the same word differently transliterated as Hariot's Openauk, and the meaning given is Turnips, Onions, and the like."

[2] This identification was first called into doubt by G. Ord (p. 162).

[3] There is a curious error on the part of Heckel *[p. 109, footnote 2]. He thinks that the indigenous name of the species was Norembega, which, according to him, indicates that the plant was cultivated in Virginia for some time, since it had received from the natives a name different from that given by the white colonists. Norembega is not the name of this or any other plant, but a designation of Virginia.

[4] This is because incomplete, secondhand quotations were relied upon; the original text was not consulted. Thus De Candolle (p. 46) depends as to Hariot on the brief paper of Sir Joseph Banks, and jumps at the conclusion: "There is no doubt that it [*openauk*] was the potato." In other points also De Candolle's study of the potato is rather mediocre, and not on the same high level as other chapters of his book. Phillips (vol. 2, p. 80) likewise regarded *openauk* as the potato.

the preceding chapter: "And these are all the commodities for sustenance of life that I know and can remember they use to husband: all else that followe are found growing naturally or wilde." The three roots, consequently, belong to these wild plants. *Solanum tuberosum* never occurred wild and nowhere occurs wild in the United States. If, however, the potato, as is conjectured, was brought from South America to Virginia, it could have thrived there only as a cultivated plant; hence none of Hariot's roots can represent the potato.

Hariot's *openauk* has been conclusively identified as *Apios tuberosa* (or *Glycine apios* L.), first by G. Ord (p. 162) and secondly by I. H. Trumbull (in Gray, vol. 2, p. 202). Others think of *Helianthus giganteus* (Wittmack, p. 566). The second of Hariot's wild roots is regarded by Trumbull as *Lycoperdon solidum* or *Pachyma cocos*. The third, he thinks, may be "Virginia potatoes," which, in my opinion, for the reasons stated, is out of the question. He says that the meaning of the Virginian name is "sun-tubers," without adding, however, a word of explanation as to how he arrives at this etymology.

My friend, Dr. Frank G. Speck, Professor of Anthropology at the University of Pennsylvania, has been kind enough to send me the following information on Hariot's three plant names:

"The three words are undoubtedly derived from *pənūk* (animate plural form, plural endings *-k*, *-ik*, *-uk*), an Algonkian root denoting a round object found in the ground. While the native languages of Virginia have been lost beyond recall for probably a century, we have at least cognate data from the Algonkian dialects of New England which have been found to be of great service in general in elucidating the Virginia ethnological terms and especially place names. So turning to Penobscot we encounter the following:

"For Virginia *openauk* there is Penobscot *pənák*, 'artichoke' and 'ground-nut' (*Apios tuberosa*), also *ponápsk*, literally 'stone,' because the tuberous roots are found in the earth like stones.

"Virginia *okeepenauk* is evidently *oki* ('ground,' 'dirt,' 'earth'; *oki*, *aki*, *atsi* are universal Algonkian roots) and *penauk*.

"Virginia *kaishucpenauk*. Trumbull's translation 'sun-tubers' is a guess, probably based upon the Algonkian root for 'sun' (Wabanaki *gizos*, Delaware *gischuch* [Brinton, 1888], New Jersey Delaware *kiisku*). *Kaishuc* may correspond to the Nanticoke *kawscup* and *koshcup* ('stone,' 'rock') [Brinton, 1893, pp. 331–332]. This brings 'rock-tuber' in range as a suggestion.

"A. C. Parker (pp. 104–107) gives Iroquois names of artichoke and ground-nut and refers to Kalm, *Travels*, etc., who mentions *hapniss* as ground-nuts, and to *Jesuit Relations*, 1634, p. 36. Most strikingly in support of your contention is Parker's reference to a mistaking of the ground-nut for potato in the naming of a now extinct Iroquois clan, the Sconescheronon or Potato People (p. 106, quoting Paris Document of 1666).

"C. C. Willoughby (1906, p. 131) also gives information on the artichoke and refers to Champlain as having seen the plant cultivated by the Indians of Nauset (Massachusetts) Harbor in 1605 and Gloucester in 1606. C. C. Willoughby (1907, p. 85) has likewise notes on ground-nuts and *tuckahoe* (*Pachyma cocos?*), which is worth considering as a possible intention in the three kinds of *-penauk*. I might add that *tuckahoe* seems to me to be a corruption of *ptúkwi*,' round' (cf. Mohegan *tukwuni'·g*, 'bread,' meaning rounded baked loaves). W. R. Gerard (pp. 109–110) gives a review of the objects; *tuckahoe* and its etymology is given value the same as mine. He makes the term cover the ground-nut (*Apios tuberosa*) previously referred to, and also *Peltandra alba*, which was dried in the sun or by fire. Does this suggest anything bearing upon 'sun tuber'? Bread was made of all these substances (Penobscot *abán*,[1] Nanticoke *apán*,[2] New Jersey Delaware *apoon*). He translates *okipen*,[3] as I do, by 'earth tuber' and refers it to *tuckahoe*.

"The term for 'potato' proper appears among the eastern Algonkian, without exception, in the form of an English loan-word. Thus we have Wabanaki *aptcédezal* (plural inanimate *-al*) and variant in the constituent dialects, Micmac *tepatát* (probably from the French). The nearest we can come to the Virginia region with our modern Algonkian vocabularies is the instance of the Nanticoke, formerly of Maryland, now on the Six Nations Reserve, Ontario, where I obtained the following synonyms for potato, *poté·tos·an* and *dä't·äs·u*, both English loans. Probably the white potato was not a native in their economy, or they would have had a name for it."

Additional information on these food plants of the Indian tribes of eastern North America is given by Dr. Speck (p. 70) and W. E. Safford (1925, pp. 116–121), who has two illustrations of *Glycine apios;* also Gilmore (p. 94).

[1] "Some possibility exists that this may be a loan-word from the French *le pain*."

[2] "From Nanticoke vocabulary collected by me at Six Nations Reserve, Canada, in 1914."

[3] "Apparently singular form of *okipenauk*."

The principal reason, however, why Hariot's *openauk* cannot be the potato, must be recognized in the fact that in his time the South American potato did not exist in Virginia, and, as will be demonstrated, was introduced into Virginia as late as 1621. In fact, no account of Virginia written prior to that date makes any mention of the potato. John Brereton (Purchas, vol. 18, p. 314) wrote in a letter from Virginia in 1602: "Also, in every Iland, and almost every part of every Iland, are great store of Ground-nuts fortie together on a string, some of them as bigge as Hennes egges; they growe not two inches under ground: the which Nuts wee found to bee as good as Potatoes." Likewise Gabriel Archer, who, in the company of Bartholomew Gosnold, visited the northern part of Virginia in 1602, alludes only to ground-nuts (*Apios tuberosa*); and these only are mentioned again by George Waymouth on his visit to Virginia in 1605 (Purchas, vols. 18, p. 308; 19, p. 358 *[?]). John Smith, in *The generall historie of Virginia . . .*, London, 1624 (p. 10 *[1907 ed., vol. 1, p. 20]) reports: "Ground-nuts, *Tiswaw* we call *China* roots; they grow in clusters, and bring forth a bryer stalke, but the leafe is far unlike, which will climbe up to the top of the highest tree: the use knowne is to cut it in small peeces, then stampe & straine it with water, and boyled makes a gelly good to eate."

It was hitherto unknown, at least to those who have discussed the history of the potato, when and how it was transmitted to North America. De Candolle *[p. 47] merely indulges in speculations to the effect that some inhabitants of Virginia, perhaps English colonists, received tubers from Spanish or other travelers, traders, or adventurers, during the ninety years which had elapsed since the discovery of America. Roze, Wittmack, Brushfield, and others, to whom we owe monographs on the subject, are equally vague. In search of information I first delved into the early history of Virginia, but with no success. Finally, after a long quest, I chanced to peruse the old *Historye of the Bermudaes*, and was at last rewarded by finding the desired information.

In 1613 the good ship *Elizabeth* brought potatoes from England to the Bermudas. *The historye of the Bermudaes*, ascribed to Captain John Smith (1580–1631),[1] reports this event as follows (Lefroy,

[1] *The historye of the Bermudaes* is attributed by its editor, J. H. Lefroy, on inward evidence to Captain John Smith (1580–1631), the historian of Virginia. This attribution has been challenged by E. D. Morgan (in Markham, 1892), who ascribes the work to Nathaniel Butler, governor of Bermuda (1619–22) and afterwards governor of Providence Island (1638–41). The question is of no importance for the present work; personally I incline toward the opinion of Lefroy.

p. 30): "In her wer first brought into thes partes certaine potatoe rootes sent from England, the which being planted and flourishinge very well, wer by negligence almost lost; at last, by a lucky hand, again reuiued from two cast awaye rootes; they have since encreased into infinite store, and serue at the present for a maine releife to the inhabitants."[1]

It was from the Bermudas that the potato was further transmitted to Virginia. On the 2nd of December, 1621, Captain Nathaniel Butler, governor of the Bermudas, sent from "St. Georges, in the Sommer Ilands," to the governor of Virginia (Francis Wyatt) two large cedar chests, "wherein wer fitted all such kindes and sortes of the country plants and fruicts, as Virginia at that time and vntill then had not, as figgs, pomegranates, oranges, lemans, plantanes, sugar canes, potatoe, and cassada rootes, papaes [papaya], red-pepper, the pritle peare [prickly pear], and the like." (*Ibid.*, p. 277.) In the following year, a Virginian barcke took from the Bermudas twenty thousand waight of potatoes at the least (*ibid.*, p. 285). All this is on record in *The historye of the Bermudaes.* In the chapter "Virginian Affaires since the yeere 1620 till this present 1624," published by Purchas (vol. 19, p. 147), the same event is alluded to as follows:

"A small ship comming in December last [1621] from the Summer-Ilands, to Virginia, brought thither from thence these Plants, viz. Vines of all sorts, Orange and Leman trees, Sugar Canes, Cassado Roots (that make bread), Pines [pineapples], Plantans, Potatoes, and sundry other Indian fruits and plants, not formerly seene in Virginia, which begin to prosper very well."

The fact that potatoes were actually planted in Virginia at the very moment of the first introduction is confirmed by letters sent from Virginia in 1621 and published by Purchas (vol. 19, p. 151); it is intimated there that ". . . in December last they had planted and cultivated in Virginia . . . Potatoes, and sundry other Indian fruits and Plants not formerly seene in Virginia, which at the time of their said Letters began to prosper very well."[2]

[1] Compare also page 3, where "many other proffitable rootes, as an infinite quantitie of white, redd, and orange-couloured potatoes" are listed among the plants introduced into Virginia. Lefroy (p. 30, footnote 2) annotates, "These potatoe roots, sent from England, can only have been the common potatoe (*Solanum tuberosum*), introduced towards the end of the previous century, and not yet even known in Holland."

[2] The sweet potato is out of the question in the above accounts, for it was already introduced into Virginia at a much earlier date, as we know from Strachey (p. 31), according to whom "potatoes [that is, sweet potatoes] were introduced

The potato, accordingly, entered this country, not, as surmised by De Candolle, through an alleged band of Spanish adventurers, but in a perfectly respectable manner—from England by way of Bermuda. It is a prank of fortune, of course, that the potato, originally a denizen of Peru and Chile, appears as a naturalized Englishman in the United States. This result is bound to modify to a certain extent the entire early history of the potato, as it has hitherto been conceived.[1]

It is now perfectly clear that the potato could not have been known to Hariot and that Hariot could not have introduced it into England. It was one of the plants which "at that time and until then [1621] Virginia had not." As justly pointed out by Dr. Speck, the word for the potato among the eastern Algonkians invariably appears in the form of a loan-word. I may add Choctaw *Ilish ahe;* that is, "Irish batata" (*ahe=age*, 'batata' or 'sweet potato').

While not a single report or letter from Virginia up to 1621 makes mention of the potato, it is frequently referred to after that date. Thus it is stated in *A perfect description of Virginia* (1649) (in Gray, vol. 2, p. 202) that the English planters have "roots of several kindes, Potatoes, Sparagus, Carrets, . . . and Hartichokes." Thomas Jefferson (p. 69) writes, "We cultivate also potatoes, both the long and the round."

into Virginia from the West Indies." This event must have taken place toward the end of the sixteenth century. In consequence, the sweet potato was then called in Virginia the "West Indie potatoe." E. W. (*Virginia*, London, 1650, p. 42) writes, "The West Indie Potatoe (by much more delicate and large then what wee have heere growing) besides that it is a food excellently delicious and strongly nourishing, fixes himselfe wherever planted with such an irradicable fertility that being set it eternally grows: of this an extraordinary pleasing and strong drinke may bee composed."

[1] At the meeting of Section H of the American Association for the Advancement of Science held in Chicago, 1920, I read a paper on "The American Plant Migration" in which I gave an abstract of the history of the potato *[later published: Laufer, 1929]. This story was widely circulated through the Associated Press, and I received numerous letters from all parts of the country with interesting comments. Mr. E. A. M. Callan, Director of Agriculture at Paget East, Bermuda, wrote under February 4, 1921, as follows: "According to an item which appeared this week in our local newspaper, you have credited this little British Colony with presenting the potato to the United States. Like all others interested in the potato, I had always accepted De Candolle's statements with respect to its introduction into America, and though I was aware that the Colonists here aided those in the sister Colony of Virginia by gifts of food, and saved that Colony from extinction by starvation, I did not know until reading your article that the 'potatoe' was included. If at any time I had read of the contents of the two large cedar chests, it is probable that I assumed the potatoes from Bermuda were not the first to arrive in Virginia. I am now glad to be enlightened by you. You may be interested to know that Bermuda still continues to send potatoes to the United States, for our principal export is the potato, and New York is our sole market."

P. Kalm (vol. 2, p. 89), who visited Albany in 1749, says that potatoes are generally planted there. When traveling in Canada, he observed that neither the common nor the sweet potato was planted in Canada. "When the French here are asked why they do not plant potatoes, they answer that they cannot find any relish to them, and they laugh at the English who are so fond of them." (*Ibid.*, p. 275.)

Safford (1925, p. 223) has discovered a very interesting story according to which in 1719 a colony of Scotch-Irish immigrants, who established a settlement at Londonderry, Rockingham County, New Hampshire, brought with them potatoes and flax. This, however, was not the first introduction of the potato into North America, but merely a subsequent local introduction into a certain territory. This has happened in the history of the potato a hundred times, as will be seen in the consideration of the subject in Europe, China, and India, where numerous names of potato introducers are known locally in the same country; the historian must grasp this situation clearly and not confound such incidental local plantations with the first spontaneous movement. At the outset the record of a plant introduction does not signify in itself that it was the first that took place, as many plants were introduced several times into the same locality; nor does the record of an introduction go to prove that the plant in question did not previously exist in the country under consideration; proof for this fact must also be established.[1]

Several Indian tribes of North America have to some extent adopted potato culture; for instance, the Gosiute of Utah (Chamberlin, p. 382).

[1] The account cited by Dr. Safford is found in a work by C. A. Hazlett (p. 506) and runs as follows:

"The first crops raised by the emigrants were potatoes and flax. They had brought their seed and spinning wheels from Ireland and were the first to cultivate the potato and manufacture linen in New England. They appear to have cultivated land in common the summer after their arrival, as there is a tract known by the name of the 'Common Field,' containing about two and one-half acres and situated a few miles west of the dwelling house of Mr. Jonathan Cate in Derry. It was undoubtedly a clearing, and may have been an abandoned planting ground of the Indians, who were gradually retiring to deeper shades of the wilderness in the wilds of Canada.

"A more detailed description, with perhaps a flavor of romance, is given by Parker in his *History of Londonderry* *[pp. 48–49]. Describing the arrival of the settlers of this town he says:

" 'They introduced the culture of the potato which they brought with them from Ireland. Until their arrival, this valuable vegetable, now regarded as one of the necessities of life, if not wholly unknown, was not cultivated in New England. To them belongs the credit of its introduction to general use. Although highly prized by this company of settlers, it was for a long time but little regarded by

The Tewa know the potato under the name *papa*, which they derived from the Spaniards (Robbins, Harrington, and Freire-Marreco, p. 113).

The tuber used by the Navaho as one of the chief articles of winter diet is derived from *Solanum Fendleri* A. Gray, a wild species growing abundantly in northern New Mexico. These tubers are quite small, one-half to three-quarters of an inch in diameter, of a good taste and somewhat like a boiled chestnut (Sturtevant, p. 540).

F. H. Cushing (pp. 226–227) has described this diminutive wild potato as a nutritious food formerly used by the Zuñi, which required masterly care in its preparation. It grew in all bottom-lands favored to any extent with moisture. These potatoes were poisonous in the raw state or whole, but were rendered harmless by the removal of the skin. As they were never larger than nutmegs, this had to be accomplished by a preliminary boiling with ashes. Afterward the potatoes were again stewed and eaten with the water they had been boiled in, usually with the addition of wild onions as a relish.

H. H. Smith (p. 72, and plate 32) describes and figures a peculiar potato cultivated by the Menomini, of a deep purple hue, growing differently in the hill from our "Irish potato, standing upon end, or being vertically dependent. The Menomini grower said that his grandfather grew this same kind of potato and that as far as he knew, the Menomini had always grown it." In my opinion, there is nothing extraordinary about this kind, which could easily be identified by a potato specialist with one of the numerous varieties of our own growth.

C. Pickering (p. 662) mentions the potato as forming the commencement of agriculture among the Chinook.

For the following information in regard to the introduction of the potato on northern Puget Sound, I am indebted to Erna Gunther, of the University of Washington, Seattle:

> their English neighbors: a barrel or two being considered a supply for a family. But its value as food for man and for beast became at length more generally known, and who can now estimate the full advantage of its cultivation to this country? The following well-authenticated fact will show how little known to the community at large the potato must have been. A few of the settlers had passed the winter previous to their establishment here, in Andover, Mass. On taking their departure from one of the families, with whom they had resided, they left a few potatoes for seed. The potatoes were accordingly planted, came up and flourished well; blossomed and produced balls, which the family supposed were the fruit to be eaten. They cooked the balls in various ways, but could not make them palatable, and pronounced them unfit for food. The next spring, while ploughing their garden, the plough passed through where the potatoes had grown, and turned out some of great size, by which means they discovered their mistake.' "

"Information given by Mrs. Lulu Blackinton, a Samish woman, now living on Guemes Island, Washington. She is now (1924) seventy-one years old. Mrs. Blackinton's paternal grandmother's sister was married to a man in Sumass, British Columbia. The people there had gotten potatoes from the Hudson's Bay Company. They gave some to Mrs. Blackinton's father, who planted them near Edison, Washington, where he lived. When the first crop was harvested, he gave a potlatch at which he distributed the potatoes among the guests and served them at the feast. Mrs. Blackinton stated that this occurred when she was a very small child, 'before I could talk.' The Samish word for potato is *espolox*."

THE POTATO IN SPAIN, ITALY, AND CENTRAL EUROPE

There were two introductions of the potato into Europe—an earlier one from South America to Spain and Italy, and a later one from an unknown source to England. Also, there were two varieties of the species, the earlier having reddish tubers, and the later having yellowish tubers. Let us first examine the former movement.

E. Roze (p. 61) states that the Spaniards, although they noticed the potato as one of the great resources of Peru as early as 1533, at the time of the conquest by Pizarro, were not tempted by the advantages which the tuber might have had for Spain, and that there is no document mentioning the introduction of the potato into Spain. If it was brought there (and this was doubtless the case), Roze argues, this must be ascribed to a lucky chance, perhaps resulting from the remains of provisions carried on a Spanish vessel. This chance introduction is hardly convincing, and this opinion is also contradicted by E. Heckel (p. 115). This author has found a text in the *Historia del nuovo mundo* by P. Bernabé Cobo, written in 1653, in which reference is made to the *papas* as one of the best provisions of the Indians in the province of Los Yauyos. "They are truffles," the author of this document, Diego Davile Bricegno, remarks, in 1586, "and if they were cultivated in our Spain in the same manner as here, they would be a great expedient in years of famine."[1] This document, however, cannot claim the importance which Heckel is inclined to attribute to it. It contains a purely hypothetical statement and merely demonstrates that there were Spaniards who had formed some ideas about the potato, but the question of transmission to Spain is not touched. The fact remains that thus far there is not a single Spanish document available by which this event is illustrated. Dr. Safford (1925, p. 181) remarks justly: "The exact date of its introduction into Europe is not known. It was, however, undoubtedly carried thither from Peru as a curious food of the New World, possibly by the same Spaniards who, according to Cieza, returned to Spain after having grown rich by carrying *chunyo* to the mines of Potosi." The dates for the introduction into Spain, variously given as 1580 or 1535–85 (Watt, 1893, vol. 6, p. 266) are mere guesswork.

[1] Heckel, in fact, is not the first, as he believes, who called attention to this text. It was cited as far back as 1891 by J. J. von Tschudi (p. 117), who spells the name Diego Dávila Brizeño. He was Corregidor of Yauyos in 1586, and the above citation appears in his description of that province.

The fact of the introduction into Spain may retrospectively be inferred from the appearance of the South American potato in Italy and central Europe. As to Italy, we have the testimony of Magazzini de Vallombrosa, who, in his book, *Dell'Agricoltura toscana*, printed in 1623 after his death, attributes to the barefooted Carmelites the introduction of potatoes into Tuscany from Spain, and speaks of their method of cultivation, so that they appear to have been cultivated at Vallombrosa for a certain time (Roze, p. 103). This account, of course, is vague. Another, indirect testimony comes to us from Clusius (Charles de l'Ecluse), the famous botanist from Artois (1526–1609), the author who, in his *Rariorum plantarum historia* (Antwerp, 1601, pp. lxxix–lxxx), has given, under the name *Papas Peruanorum*, the first scientific description of the plant. Two tubers with a fruit of this plant (as he himself states) were conveyed to him in 1588 by Philippe de Sivry, Seigneur of Walhain (Waldheim) and Prefect of Mons in Hainaut (Belgium), who asserted that he had received them in 1587, under the name *taratouffli*, from one of the persons who had accompanied the papal legate into Belgium; thus they had come from Italy. The legate ate these tubers, prepared like chestnuts or carrots, in order to gain strength, as he was of delicate health. The Italian provenience is also shown by the fact that Clusius avails himself, as designation for the potato, of the Italian word *taratouffli*,[1] which soon resulted in French *cartoufle* and German *tartuffel* and subsequently *kartoffel*. The potato, accordingly, must have been known in Italy during the later part of the sixteenth century, and may have been introduced into Spain about 1570 or somewhat earlier. I arrive at this date through a negative consideration: Clusius visited Spain in 1564 for a study of the Iberian flora, and his *Rariorum aliquot stirpium per Hispanias obseruatarum historia* appeared at Antwerp, 1576. The potato is not mentioned in that work.

The lack of specific accounts is not surprising. We are inclined to regard the potato as an important crop, as it holds so prominent a place in our agriculture and daily life; but it was little esteemed on its first arrival in Europe, even held under suspicion, and rather was a curious object of inquiry than one of practical utility. Its economic importance is a recent event, dating only from the latter part of the eighteenth century. What appears important to us was of hardly

[1] In C. Bauhin's *Phytopinax* (1596): *tartuffoli*. Bauhin says that this is the name given to truffles in Italy, and that potatoes are eaten there like truffles.

any significance to the people of the sixteenth and seventeenth centuries.[1]

Clusius characterizes the potato as a novel plant which had been known in Europe only a few years.[2] He adds: "Whence it has first come to Italy is not known; it is certain, however, that it must have been received either from Spain or from America. It is surprising that the knowledge of this plant reached us so late,

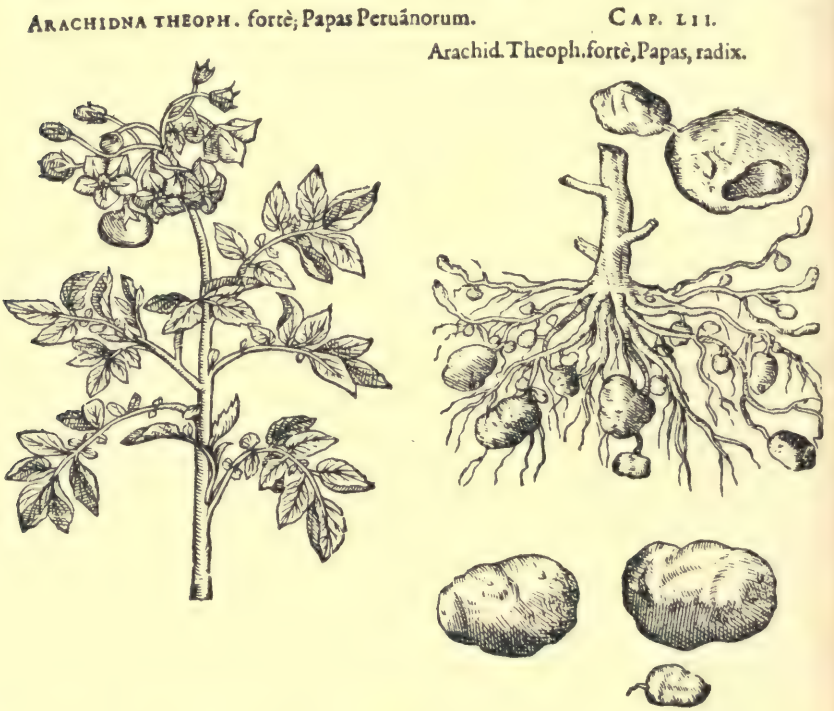

FIG. 3. Wood engraving of potato plant and tubers. (From *Rariorum plantarum historia.* Clusius, 1601.)

because, as it is said, it is so common and frequent in some places of Italy that its tubers boiled with mutton are eaten like turnips and carrots, and that they are even fed to swine. It is still more sur-

[1] In the beginning of the eighteenth century the potato was not yet cultivated in Spain; at present it is cultivated throughout that country up to an altitude of 6,000 feet (Willkomm and Lange, vol. 2, p. 525).

[2] Although he sagaciously recognized its American origin, he nevertheless fell victim to the tendency of his time to seek for a connection with the ancient world. He endeavors to show that the potato is identical with the *arachidna* of Theophrastus; but this plant is now identified as *Lathyrus amphicarpus* Dorth.

prising that the plant was unknown to the school of Padua.[1] At present it has become rather common in most of the gardens of Germany, since it is so fertile." He had no doubt that his *Papas Peruanorum* was identical with the *papas* described by Cieza, Zarate, and Gomara. For the rest, Clusius did not entertain a very high opinion of the potato as a food plant; while admitting that it is no less nourishing than chestnuts and carrots, he regarded it as crude, rough, and flatulent.[2]

Clusius' botanical description of the plant is classical, and is justly praised as a *descriptio optima* by Willkomm and Lange (vol. 3, p. 525). It is illustrated by two wood engravings *[1601, p. lxxix], which Clusius had executed from life—one representing the plant with flowers and fruit and entitled "Arachidna Theoph. fortè [perhaps]; Papas Peruãnorum"; the other showing the roots and tubers and entitled "Arachid. Theoph. fortè, Papas, radix." (Cf. Fig. 3.) It is this woodcut which has been adopted by Thomas Johnson in the second edition (1633) of Gerard's *Herball* *[p. 927] to replace Gerard's own figure in the first edition of 1597. On the eleventh page of his preface, Johnson explains that he made use of the woodcuts in the works of Dodonaeus, Lobel, and Clusius—all printed by Plantin in Antwerp. Clusius *[1601, p. lxxx] mentions two other illustrations—one transmitted to him in 1589 by Philippe de Sivry and representing the colored design of a branch with blossom and tubers; the other sent him by Garet, a druggist of

[1] This is not surprising at all. The learned usually lag behind the times and are the last to note a newly introduced plant. The farmers and the rest of the people know and esteem it much earlier. The propagation of maize furnishes the best example thereof. Clusius' information—that the potato was widely grown in Italy in his time—is therefore perfectly correct. It means very little that Targioni, as quoted by De Candolle (p. 48), has not been able to discover any proof to confirm Clusius' statement, except Magazzini's reference (1623).

[2] The main points of historical interest in Clusius' text are as follows *[1601, pp. lxxx–lxxxi]: "Primam hujus stirpis cognitionem acceptam fero N. V. Philippo de Sivry Dn. de Walhain & Praefecto urbi Montium in Hannoniâ Belgicae, qui ejus bina tubera cum fructu, Viennam Austriae ad me mittebat sub initium anni M.D.XXCVIII, sequente autem anno rami ejus cum flore picturam. Is à familiari quodam Legati Pontificis in Belgio se accepisse scribebat anno praecedente, *Taratouffli* nomine. Mittebat deinde ad me Iacobus Garetus junior, integrae stirpis iconem Francofurtum. . . .

"Unde primum nacti sint Itali, ignorant: certum autem est, vel ex Hispanijs, vel ex Americâ habuisse. . . . Nunc verò plerisque Germaniae hortis satis vulgaris est facta, quandoquidem adeò foecunda est. . . . His castanearum aut pastinacae in modum paratis, vescebatur, ut intelligo, Legatus, ad firmandas vires, quia erat valde imbecillâ valetudine: non minus autem alere puto quàm castaneas & pastinacas, flatulentas tamen esse, propterea, ad proritandam Venerem, nonnullos uti. Ego elixas, deinde, epidermide verius quàm cute purgatus, facilimè enim cedit, & inter binas lances, naporum aut raporum pinguiore vervecis jusculo maceratas degustabá: & sanè non minùs sapidas & palato gratas deprehendebam, ipsis napis. Crudas verò, nimis asperas & flatulentas esse aestimo."

FIG. 4. Potato plant showing branch with blossoms and tubers. (Reproduction of water-color sent to Clusius by Philippe de Sivry in 1589. After Roze. Courtesy of the John Crerar Library.)

London (see p. 48). The former is still preserved in the Musée Plantin-Moretus of Antwerp in which the archives of the old printing-house of Plantin of the sixteenth century are housed. This water-color bears the following legend in Clusius' own hand: "Taratoufli a Philipp de Sivry acceptum Viennae 26 Januarii 1588. Papas Peruänum Petri Ciecae." This was inscribed by him at Francfort in 1589, when he received the figure; the year under the picture refers to the date when he obtained the two tubers and a fruit from Philippe de Sivry (cf. Fig. 4). A colored reproduction of this design is given in the work of E. Roze *[opposite p. 16], and after his plate in a somewhat reduced halftone by L. Wittmack (plate VIII). According to this author, the figures of Clusius still agree in all essential features with the potato of the present time.

THE POTATO IN GREAT BRITAIN

The first hint of the potato being grown in Britain is in the catalogue of John Gerard's garden in Holborn, printed in 1596—the earliest known catalogue of any garden. In this list the name "Papus Hyspanorum" is applied to the potato. An enlarged edition of this catalogue appeared in 1599. The fundamental document relating to the introduction of the plant into England is presented by John Gerard's *The herball; or, General historie of plantes*, first published in London and printed by John Morton, 1597. In Chapter 335, pp. 781–782, a description of the potato is given under the heading "Of Potatoes of Virginia," accompanied by an illustration of the plant, entitled "*Battata Virginiana sive Virginianorum & Pappus.* Potatoes of Virginia." The term *batata* properly applies to the sweet potato only, styled by Gerard in the preceding chapter "*Sisarum Peruvianum, sive Batata Hispanorum.*"

The designation "potato of Virginia" was employed in England at least up to the year 1640, and then gradually gave way to the plain "potato," which hitherto had been applied to the sweet potato.

It is clearly brought out by Gerard's illustration and description of the plant that he really speaks of *Solanum tuberosum.* He states: "It groweth naturally in America[1] where it was first discovered, as reporteth *C. Clusius*, since which time I have received rootes hereof from Virginia, otherwise called Norembega, which growe and prosper in my garden, as in their owne native countrie."[2]

He describes the "root" of the potato as "thicke, fat, and tuberous; not much differing either in shape, colour or taste from the common Potatoes [that is, the sweet potato], saving that the rootes hereof are not so great nor long; some of them are as round as a ball, some ovall or egge fashion; some longer, and others shorter: which knobbie rootes are fastened unto the stalkes with an infinite number of threddie strings."[3] In regard to nomenclature he observes: "The

[1] In the language of the period this means "South America."

[2] First edition, p. 787; second edition, 1633, p. 927. The texts in the two editions are identical, save for unimportant deviations in spelling. Two additional notes of Johnson which do not affect Gerard's notice are given on page 52, below.

[3] Roze (p. 67) comments on Gerard's description thus: "Cette description, bien que fort détaillée, laisse à désirer en ce qui concerne les tubercules. Il est difficile, dans le comparaison qui est faite des Pommes de terre avec les Batates, de comprendre bien nettement ce que voulait dire Gerarde. D'un autre côté, ce qu'il dit de Clusius au sujet de la découverte des *Papas*, ne peut s'expliquer que par des relations qu'il avait dû, avant 1597, entretenir avec ce savant botaniste." The information certainly emanates from Clusius; but, as will be seen, indirectly, through the medium of John Garet of London.

Indians do call this plant *Papus* [2nd ed., *Pappus*] (meaning the rootes) by which name also the common Potatoes are called in those Indian countries. We have the name proper unto it, mentioned in the title. Bicause it hath not onely the shape and proportion of Potatoes, but also the pleasant taste and vertues of the same, we may call it in English Potatoes of America, or Virginia."

Gerard, accordingly, makes no reference whatever to the *openauk* of Hariot (nor does he allude to or repeat his description), but employs the correct Peruvian name *pappus*, which he had learned from Clusius (*papas*). Gerard's identification had accordingly been confirmed by Clusius.

With reference to the utilization, Gerard remarks (p. 782), "The temperature and vertues are referred unto the common Potatoes; being likewise a foode, as also a meate for pleasure, equall in goodnesse and wholesomnesse unto the same, being either rosted in the embers, or boiled and eaten with oile, vineger and pepper, or dressed any other way by the hand of some cunning in cookerie."

There can thus be no doubt that within the brief span of a decade (1586–96) the potato became well known in England. Facing page 1 of the first edition (1597) of Gerard's monumental work, there is a portrait engraved by Payne, representing Gerard with a spray of the potato plant with flowers and berries in his left hand, as a reminder of the importance which he attributed to this novel plant, or, as said by Jackson, thereby testifying to his pride in its possession and his estimation of it as the most remarkable in his collection (cf. Fig. 5).

The principal testimony, accordingly, around which the history of the potato in England pivots, is Gerard's, while Hariot's name must be eliminated from consideration in the history of the subject. It was not Hariot who brought the potato to England: he lays no claim to this honor, nor does Gerard or any one else assign it to him. Gerard's record proves two events: first, that prior to the introduction into England the potato was known to Clusius, that is, on the European continent; and second, that, independently of the earlier introduction into Spain, it reached England from "Virginia," or rather North America. *[On this point see pp. 52 ff.]

The reference to Clusius proves that information from that quarter had been imparted to the English herbalist; but Clusius' work which contains his notice of the potato appeared only in 1601, several years after Gerard's *Herball*. There is no evidence for assuming that Gerard ever was in correspondence with Clusius;

Gerard had few foreign friends, and Clusius was not one of them. Clusius does not even make any reference to Gerard's contribution, although he must have had cognizance of it; but he alludes to a figure of the entire plant which "subsequently [that is, after 1588] Jacobus Garetus junior had sent him to Francfort." *[1601, p. lxxx.] James Garet was a druggist and citizen of London, an old friend of Clusius from as far back at least as 1581, when Clusius spent six months in England on his third and last visit there. It is deplorable that Garet's sketch of the potato is lost—at least, has not yet been rediscovered; it would doubtless form an important piece of evidence for the English side of the history of the potato. In my estimation, it would prove to be very similar to, if not identical with, the woodcut inserted in Gerard's first edition of 1597; in all probability, Garet even was the author of this sketch, for he was an intimate acquaintance of Gerard, who cites him nine times, while he is quoted eleven times in Clusius' *Historia* and fifteen times in his *Exoticorum*. Garet, accordingly, as justly concluded by B. D. Jackson (p. 161), was the link between Gerard and Clusius. It does not require a stretch of the imagination to piece together the threads of the lost correspondence. It was after 1588 that Garet sent Clusius from London his figure of the plant, which had been raised in his own or Gerard's garden, asking for his opinion of the exotic newcomer. The sketch was clear enough to enable Clusius to recognize it as his *Papas Peruanorum*, and in this sense he replied to Garet, who on his part conveyed the information to Gerard; thus it entered into Gerard's *Herball*, and he was upright enough to give credit to Clusius. It is out of the question, as has been intimated by some, that Gerard received his potato solely and directly from Clusius. This is utterly impossible, as above all demonstrated by the evidence of Garet's sketch. Moreover, what Clusius describes is the variety with red-skinned tubers, while Gerard's cultivation is one of the yellow-skinned variety. A superficial comparison of the two illustrations demonstrates sufficiently that they represent distinct varieties, which originated from different quarters. Hence the veracity of Gerard's historical account, in its general outlines, cannot be questioned.

Garet's sketch furnishes prima facie evidence for the fact that the potato was known in England after 1588 or between 1588 and 1601. A negative piece of evidence for the *terminus a quo* is given by the fact that Clusius on his visit to London in the beginning of the year 1581 (see above), when he bought fresh sweet potatoes

FIG. 5. John Gerard holding spray of potato plant. (From 1597 edition of his *Herball; or, General historie of plantes.* Courtesy of the Newberry Library.)

there, did not see or hear of the common potato in England, nor did he then receive specimens of it from Drake, with whom he was on intimate terms. Hence I am inclined to think that in 1581 the potato had not yet arrived in England; but it surely must have been known there between 1586 and 1590. The latter is the *terminus ad quem*, as in that year the last English vessels returned from Virginia.

W. S. M(itchell) has subjected Gerard's account of the potato to an unduly severe and harsh criticism, which on a few points may be approved, but which in its bilious acrimony and hostility overshoots the mark, and is entirely negative as to its result. True criticism must be constructive, not destructive. Mitchell *[p. 553] finds considerable fault with Gerard's illustration; according to him, " . . . we cannot trace the source of that figure; we cannot say where the plant grew which is there represented; least of all are we in a position to say it is a figure of Heriot's Openauk. [This remark is baseless, since the figure is not intended as such, and Gerard does not even allude to Hariot and his *openauk*.] It is the earliest extant figure of a potato known . . . but beyond recognizing the interest attaching to it on this account and the skill evinced, it cannot be regarded as of any importance. It cannot be used as any evidence for proving anything." He finally suggests that Gerard must have received the illustration from the Continent,[1] and concludes *[p. 585]: "There is no proof of potatoes having been brought from Virginia beyond Gerard's own statement. There is the probability he somehow had two sets of roots mixed or confounded the one with the other." L. Wittmack (p. 567) has already made a convincing plea in favor of Gerard and *versus* Mitchell; and Wittmack is not a layman, but a critical scholar, who for many years has cultivated and studied *Solanums* and potatoes in particular (not to speak here of his excellent work in other fields), and who is well familiar with the early accounts. According to Wittmack, Gerard's figure does not merit the condemnation meted out to it by Mitchell; he clearly recognizes in it the essential properties of the potato plant; the tubers are evidently much reduced, but it will not do to infer from this illustration that their actual dimensions were minute; they are correctly described in Gerard's text. Whatever defects may be attached to the figure, it does represent, as Mitchell himself admits, *Solanum tuberosum*, and was drawn in England from a live specimen raised by Gerard; and whatever flaws may be picked in the nomenclature and description, it refers beyond cavil to the same species,

[1] This supposition is absurd and is refuted by my remarks above.

with which therefore Gerard and his contemporaries were acquainted. W. M. Rowland (p. 566), in response to Mitchell's onslaught, justly calls attention to the frontispiece representing the old herbalist with a flower in his hand which certainly is a potato blossom, and remarks: "I think, therefore, the old man knew what he was saying about the Potato, and took interest enough in it to be painted with a flower of it in his hand."[1]

B. D. Jackson (pp. 161–162) has ventured the following criticism: Gerard "must have had some knowledge of the plant before it came into his hands, but Gerard was not famous for his straightforwardness. His garbled account of Dr. Priest's translation of the *Pemptades* of Dodoens, which was the foundation of his *Herball*, is curiously like a falsehood. . . . It is therefore not impossible that he set himself to mystify the readers of his *Herball* as to the source whence he derived his Potatos. On the other hand, it may be charitably allowed that he was careless in many points, and did not trouble himself in matters of detail, or precision of fact. Whichever way it is to be accounted for, he certainly succeeded in leading successive generations to suppose that he had his plants by way of Virginia." But if this allegation was so utterly false, why did his contemporaries not contradict him? The British public of those days assuredly was not so credulous. There was Johnson, who in 1633 brought out a revised and enlarged edition of the *Herball*, and who by no means was blind to Gerard's shortcomings, as expressly remarked in his preface. He had the opportunity of making any corrections, alterations, or additions in Gerard's text. All he did, however, is limited to replacing Gerard's figure by that of Clusius (as he evidently regarded the latter as preferable) and to the two following additional notes:

[1] The supercritical Mr. Mitchell, like most of his kind, is himself very uncritical in the treatment of the subject: to him the *openauk* is the potato, and not a wild root; he consequently did not read Hariot's account with open eyes. He spills a great deal of ink over the alleged mystery as to how Gerard got hold of the South American name *papas*, which never occurred in Virginia or North America. This information, as has been shown, he had simply received through the mediation of Garet from Clusius, whom he expressly quotes. True it is that Gerard is our only witness who testifies that the potato has reached England from Virginia. This, of course, is somewhat unfortunate, and I myself should like to see a more circumstantial report from the pen of one of the returning colonists; but we are accustomed to this dearth of news in the history of cultivated plants, and I for my part can see no reason why Gerard's testimony should be discounted. The general course of English colonial enterprise at that memorable epoch reveals plainly the fact that the potato arrived in England from some point on the coast of North America; whether it was cultivated there at that time is another question. Mitchell flatly rejects any traditions, but he fails to inform us as to how and when the transmission was effected.

"*Clusius* questions whether it be not the *Arachidna* of *Theophrastus*. *Bauhine* hath referred it to the Nightshades, and calleth it *Solanum tuberosum Esculentum*, and largely figures and describes it in his *Prodromus, pag.* 89." *[1633, p. 927.]

"*Bauhine* saith, That he heard that the use of these roots [misprinted *toots*] was forbidden in Bourgondy (where they call them Indian Artichokes) for that they were persuaded the too frequent use of them caused the leprosie." *[p. 928.]

There is no criticism of Gerard, whose original text he has reproduced word for word, save some slight modifications of spelling. Johnson, therefore, can have had no other thought than that Gerard's account of the potato was correct and that it was an epoch-making document.

The crucial question, of course, remains as to the source from which Gerard received the tubers, and whether his assertion that it came from Virginia is to the point. Documentary evidence for the decision of this question is lacking, so that the door is wide open for speculation. The label "Virginia" has been vehemently contested by several writers; among these, as mentioned, by Mitchell and Jackson, who are joined by Wittmack. It is perfectly true that *Solanum tuberosum* is not a native of Virginia, that it was never cultivated by the pre-Columbian aborigines there, and that there is not a particle of evidence for its existence in Virginia at the times here under consideration. It was introduced there, as well as to other parts of North America, at a far later date. Those who have taken Gerard's statement at its surface value are naturally carried away to lofty speculations; thus, A. de Candolle (p. 47), when he observes: "It seems to me most likely that some inhabitants of Virginia—perhaps English colonists—received tubers from Spanish or other travellers, traders or adventurers, during the ninety years which had elapsed since the discovery of America. Evidently, dating from the conquest of Peru and Chili, in 1535 to 1585, many vessels could have carried tubers of the potato as provisions, and Sir Walter Raleigh, making war on the Spaniards as a privateer, may have pillaged some vessel which contained them. This is the less improbable, since the Spaniards had introduced the plant into Europe before 1585." All this is possible, but there is not the slightest proof that this account is correct. Jackson (p. 180) surmises that "the original stock came from some captured town or ship. . . . Drake. . . sacked Carthagena, at a time when the cultivation of the Potato had long before reached as far north as New Grenada."

Whatever may have been the actual home of the potato tubers which arrived in England between 1586 and 1590, there is no doubt in my mind that they were received by Gerard with the specific label and positive information "from Virginia!" Gerard did not attempt or intend to "mystify his readers," as suggested by Jackson, but simply restated what he had been told. It goes without saying that specimens wrongly labeled as to locality have many hundreds of times reached botanists, zoologists, mineralogists, and ethnographers. This, in fact, happens in our museums every day without provoking a commotion in our breasts, and why get excited over a wrong label of the sixteenth century? Gerard's account conveys the strong impression that he is thorough and serious about the subject, which had endeared itself to him, that he attributes to it much importance, and that his statements are not jotted down in a light-minded spirit. Aside from the appearance of the name "Virginia" in the nomenclature, he refers to it in the descriptive text, which begins, "Virginia Potatoes hath many hollowe flexible branches"; again, "since which time I have received rootes hereof from Virginia, otherwise called Norembega," and "we may call it in English Potatoes of America, or Virginia." Gerard had a clear conception of Virginia, as clear at least as any one could have at that time, and was familiar with the events that had taken place there, as shown by the following passage of his work (1597, p. 752): "There groweth in that part of Virginia, or Norembega, where our English men dwelled (intending there to erect a Colony) a kind of *Asclepias*, or Swallow woort, which the Savages call *Wisanck*." Again, "It groweth, as before is rehearsed, in the countries of Norembega, and now called Virginia by the H. sir *Walter Raleigh*, who hath bestowed great summes of monie in the discoverie thereof, where are dwelling at this present English men, if neither untimely death by murdering, or pestilence, corrupt aire, bloodie flixes, or some other mortall sicknes hath not destroied them." In regard to the "prickly Indian Fig tree" (*Opuntia ficus indica*), he writes (1597, p. 1330): "This plant groweth in all the tract of the east and west Indies, and also in the countrey Norembega, now called Virginia, from whence it hath beene brought into Italy, Spaine, England, and other countries." With reference to maize he observes (1597, p. 77), ". . . out of America and the Ilands adioyning from the east and west Indies, and Virginia or Norembega, where they use to sowe or set it, and to make bread of it. . . ." By the term "America" Gerard understands South America, as shown by his "Potatoes of America or Virginia" (the

definition "America" being suggested by the *Papas Peruanorum* of Clusius), and still more clearly by his reference to tobacco, where he says: "It was first brought into Europe out of the provinces of America, which is called the west Indies, in which is the province or countrey of Peru." (1597, p. 286.)

Gerard certainly did not receive the potato from Raleigh or Drake; otherwise he would have so stated. He must have received it, however, from some unknown pilgrim who crossed the ocean in 1584 under a patent granted by Queen Elizabeth to Sir Walter Raleigh.

Tradition has it, further, that Sir Walter Raleigh himself had the tubers planted on his estate of Youghall near Cork in the south of Ireland, and soon after carried them into Lancashire. The story goes that he gave them to his gardener as a desirable fruit from America, and ordered them to be planted in his kitchen garden. In August the plants flowered, and in September produced fruit; but the berries were so different from what the gardener expected that in a fit of ill humor he carried the potato-apples to his master, exclaiming, "Is this the fine fruit from America you praised so highly?" Sir Walter either was, or pretended to be, ignorant of the matter; and desired the gardener, since that was the case, to dig up the weed and throw it away. The gardener, however, soon returned with a good parcel of potatoes.[1] This, of course, is merely an anecdote without historical value.

I am in sympathy with those who incline toward the opinion that the introduction into England may belong to the merits of Sir Francis Drake, who had invaded those countries where the potato

[1] H. Phillips (vol. 2, p. 81), who cites Appendix to the Report of the Committee of the Board of Agriculture, on the Culture of the Potatoe (cf. G. W. Johnson, p. 8). Safford (1925, pp. 217–218) states that the value of the potato as a food staple was first recognized in Ireland, where conditions of soil and climate were peculiarly favorable for its propagation. The tradition that Walter Raleigh planted the tubers on his estate of Youghall near Cork in southern Ireland may be relegated to the realm of fable. While it is not known by whom and when the potato was introduced into Ireland, it was cultivated there as a field crop before 1663, a year of dearth in Great Britain and Ireland. In March of that year the attention of the Royal Society was called to it as a crop of national importance by Mr. Buckland, from Somersetshire. H. Phillips (vol. 2, p. 80) remarks: "Some writers state that the potato was introduced into Ireland as early as 1566. If this was the case, it evidently must have been the batata, procured either from Spain or Italy, as we have no account of the Virginia potato having been known in Europe at that period. It was certainly used as food by the Irish long before its utility was generally known in England; and we are informed that it was accidentally thrown on our shore by a vessel wrecked on the coast called North Meols, in Lancashire; a place and soil even now famous for producing this vegetable in great perfection." This story is difficult to credit.

is both wild and cultivated. Unfortunately this impression cannot be substantiated by documentary evidence.

J. Fiske (vol. 2, p. 313) confounds potatoes and sweet potatoes, as do so many others, in expressing his view as follows: "As Humboldt says, potatoes were common all over the West Indies before 1580, and had even found their way into the gardens of Spain and Italy. In 1586 Lane's party of Raleigh's people, a hundred or more in number, had been staying for a year upon Roanoke Island, where they had hoped to found a colony. They were short of food, when all at once Sir Francis Drake arrived from the West Indies and brought them a supply of provisions, with which they prudently decided to go home to England. Evidently their potatoes, which were planted on an estate of Raleigh's in Ireland, did not come from 'Virginia,' but from the West Indies."

L. Wittmack (p. 569) presents the conclusion: "It is certain that the potato arrived in England about 1586 or a little later; how, remains uncertain, hardly from Virginia. It seems to me most probable that Drake brought it along and handed it on to Raleigh."

The question as to who introduced the potato into England and Ireland can be answered by the sober historian only with the confession of ignorance. The story was never recorded, or if so, the record has been lost; neither Parkinson nor Bacon nor any other contemporary has a word about the introduction. This, after all, is not surprising, for no special importance was attached to the newcomer; its arrival was of no general interest, and it did not attract public attention. To us the question appears important because the potato occupies so prominent a place in our present economic life, but this place it has held for hardly two hundred years. All that has been said about John Hawkins, Thomas Hariot, Raleigh, and Drake as introducers is the merest speculation unsupported by any evidence, or partially rests on a confusion with the sweet potato.[1]

John Parkinson (p. 516) distinguishes clearly between the sweet potato, the potato of Virginia, and the potato of Canada (*Helianthus tuberosus*). In regard to the last-named he says: "We in England,

[1] T. N. Brushfield (especially p. 178) pleads for Hariot as being the importer of the potato into England and sharing with Raleigh in the merit of its introduction, while to the latter alone is due the honor of promoting its cultivation and of adding to the standard articles of food in England. The author, however, notes that "the printed work of Hariot omits all notice of the ordinary potato, but we have to bear in mind it was confined to a description of the native products alone." The legend that Hawkins brought potatoes from Santa Fé in Bogotá to Ireland in 1565 is already found in Putsche, *Versuch einer Monographie der Kartoffeln* (Weimar, 1819), as cited in *Dictionnaire universel d'histoire naturelle* . . . (vol. 8, p. 346).

from some ignorant and idle head, have called them Artichokes of Ierusalem, only because the roote, being boyled, is in taste like the bottome of an Artichoke head: but they may most fitly be called, Potatos of Canada, because their rootes are in form, colour and taste, like unto the Potatos of Virginia, but greater, and the French brought them first from Canada into these parts." These tubers, he remarks, had so increased, and were so commonly grown in London that even the most vulgar began to despise them, whereas on their first arrival they were dainties for a queen. With reference to the common potatoes he remarks that some foolishly call them "apples of youth." He gives a good description of the plant, saying that the roots are nearly of the same taste as sweet potatoes, but not altogether so pleasant. Both were prepared in the same way: "The Virginia Potato's being dressed after all these waies before specified, maketh almost as delicate meate as the former."

Francis Bacon, in his *Sylva sylvarum or Natural history*, written soon after Gerard's *Herball*, calls them potado-roots, and writes: "It is said, that if potado-roots be set in a pot filled with earth, and then the pot with earth be set likewise within the ground some two or three inches, the roots will grow greater than ordinary. The cause may be, for that having earth enough within the pot to nourish them, and then being stopped by the bottom of the pot from putting strings downward, they must needs grow greater in breadth and thickness. And it may be, that all seeds or roots, potted and so set into the earth, will prosper the better." (V, 743, vol. 2, p. 491; cf. also I, 47, vol. 2, p. 360.)

Early in the seventeenth century the potato was planted in the gardens of the nobility as a curious exotic, and appears to have been esteemed a great delicacy in the time of James the First, for in the year 1619 it is noticed among the different articles provided for the Queen's household. The quantity supplied was extremely small, and the price high, being at that time one shilling per pound (Phillips, vol. 2, pp. 85–86); according to others, even two shillings (Weir, p. 332).

While the potato was thus well known in England in the latter part of the sixteenth and in the first half of the seventeenth century, it was still very far from being popular or in general use. It was merely a garden product and treated as a vegetable. It first met with the same lukewarm or even indifferent reception as in France.

The old prejudice against the potato is well characterized by A. Findlay (p. 2): "Notwithstanding its many claims on popular

attention, it met the common fate of nearly all that is good—if that good runs counter to the strong conservative instinct of the average Briton. Vulgar and learned prejudice metaphorically rose in arms against it; the layman wrote against it; the priest thundered at it from the pulpit as a dangerous thing of a dangerous race—a thing to be avoided by saint and sinner alike; and it is not until 219 years (1805) from the date of its introduction into Britain that we find Dr. Buchan, in the 19th edition of his 'Domestic Medicine,' speaking of the potato as being only grown in Ireland and the north of England to any extent, and strongly urging its claims on all classes as a food-producing plant, as a means of preventing a recurrence of famine in the land." And H. Phillips (vol. 2, p. 86) expresses his opinion thus: "It was long, before potatoes were brought into general use; for by some they were reckoned not good for food, others deemed them poisonous. The lower classes, to whom this vegetable is now the greatest blessing that the soil produces—forming flour without a mill, and bread without an oven—and at all seasons of the year an agreeable and wholesome dish, unaided by expensive or injurious condiments—were the last to become acquainted with this valuable root. So difficult is it to overcome prejudices in ignorant minds! Many persons were prejudiced against the potatoe, on account of its being a species of *Solanum*, or Nightshade, alleging it was narcotic."

In 1662 (according to others, 1663) Buckland from Somerset, in a letter addressed to the Royal Society, recommended the planting of the potato in all parts of the Kingdom as a crop of national importance and as a means of checking famines; but despite the recommendation of the Society and numerous appeals to the public, the cultivation was very slow.

In 1675 J. W. Gent (p. 155) wrote: "Potatoes are very usual in Foreign parts, and are planted in several places of this Country to a very good advantage; they are easily encreased, by cutting the Roots in several pieces, each piece growing as well as the whole Root; they require a good fat Garden-mould, but will grow indifferently well in any: they are commonly eaten either Buttered, or in Milk. I do not hear that it hath been as yet essayed, whether they may not be propagated in great quantities for food for Swine, or other Cattle.

"Jerusalem Artichoaks are near of the nature of the Potatoes, but not so good nor so wholesome; but may probably be propagated in great quantities, and prove good food for Swine: They are either planted of the Roots, or of Seeds."

In 1687 Worlidge suggested that potatoes might be useful for swine or cattle. In 1699 Houghton reports that they were then very common in Lancashire, being introduced there from Ireland, and they began to spread over England. One reason that the tuber remained so long in disrepute was the defective mode of its culture; another, ignorance of the proper method of cooking it. In Scotland progress was retarded by religious prejudice; it was pretended that potatoes are not spoken of in the Bible. They were not cultivated in Scotland until 1683. In 1728, Thomas Prentice, a day laborer, first planted potatoes in open fields at Kilsyth with such success that his example was generally followed. According to others, the potato was not known in the Highlands and Isles before 1743 (Roze, p. 75; G. W. Johnson, pp. 12 ff.). It is supposed that many persons in the Highlands would have perished for want in the year 1783, had it not been for this tuber (Phillips, vol. 2, p. 90).

Bradley, in his book *New improvements of planting and gardening* *[pt. 3, p. 132], says, after describing parsnips, carrots, onions, etc.: "*Potatoes* and *Jerusalem-Artichokes*, are *Roots* of less note than any I have yet mentioned; but as they are not without their Admirers, so I shall not pass by the Method of their *Culture* in silence. The *Potatoe* rather loves a sandy than a strong Soil, tho' I have seen them do well in both; but have observ'd, that the Roots knot much better, and are sweeter tasted in the *Sand*." H. Phillips (vol. 2, p. 88), who cites this text, remarks on this occasion: "This shows us that, though the culture of the potatoe was perfectly understood in the beginning of the last century, the root, nevertheless, was not appreciated according to its merits."

John Laurence (p. 368) writes: "Potatoes are generally thought an insipid Root; but when they are cultivated in a good mixt Soil, they are not without their Admirers: The smaller Roots or Knots are commonly preserved for a succeeding Crop, which in *March* are set about eight Inches apart. About *Michaelmas* is the Time when they are first begun to be used, and they are commonly taken out of the Ground only as Occasion serves during the Winter."

During the eighteenth century England set an example to Europe and made a rapid advance in the propagation of the plant. Ever since, she has always occupied the first place in Europe in matters of potato culture, and the improvement of the potato has been the object of great care and attention. In 1822 H. Phillips (vol. 2, p. 89) could say: "The consumption of potatoes . . . on the Continent is but small, when compared to that of England and Ireland."

THE POTATO IN FRANCE

The introduction of the potato into France is independent of that into England. The first French writer who mentions and describes the potato is Olivier de Serres, seigneur du Pradel (1539–1619), in his celebrated work, *Theatre d'agriculture et mesnage des champs* (pp. 513–514) *[1802, vol. 3, pp. 173–174], first published in 1600.[1] He states that both plant and fruit are termed *cartoufle* (this name appears three times in his text and as chapter heading on the right margin) because the fruit resembles a truffle, and that it has come from Switzerland to Dauphiné only a short while ago. By whom it was introduced is not known. His description, which shows that he was quite familiar with the method of planting potatoes and preparing them for food, is in the first edition as follows:

"Cest arbuste, dit cartoufle, porte fruict de mesme nom, semblable à truffes, et par d'aucuns ainsi appellé. Il est venu de Suisse, en Dauphiné, despuis peu de temps en çà. La plante n'en dure qu'une annee, dont en faut venir au refaire chacune saison. Par semence l'on s'en engence, c'est à dire, par le fruict mesme, le mettant en terre au commencement du Printemps, aprés les grandes froidures, la Lune estant en decours, quatre doigts profound, desire bonne terre, bien fumee, plus legere que pesante: l'air moderé. Veut estre semé au large, comme de trois en trois, ou de quatre en quatre pieds de distance l'un de l'autre, pour donner place à ses branches de s'accroistre et de les provigner. De chacun cartoufle sort un tige, faisant plusieurs branches, s'ellevans iusques à cinq ou six pieds, si elles n'en sont retenus par provigner. Mais pour le bien du fruit, l'on provigne le tige avec toutes ses branches, dés qu'elles ont attaint la hauteur d'un couplé de pieds; d'icelles en laissant ressortir à l'air, quelques doigts, pour là continuer leur iect: et iceluy reprovigner, à toutes les fois qu'il s'en rend capable, continuant cela iusques au mois d'Aoust: auquel temps les iettons cessent de croistre en fleurissans, faisans des fleurs blanches, toutesfois, de nulle valeur. Le fruit naist quand et les iettons, à la fourcheure des noeufs, ainsi que glands de chesne. Il s'engrossit et meurit dans terre, d'où l'on le retire en ressortant les branches provignees, sur la fin du mois de Septembre,

[1] During the author's lifetime there appeared eight editions of this classical work which occupies a prominent place in the history of French prose. In the interval from 1629 to 1661 four editions were published at Geneva, and five at Rouen; another at Lyons in 1675. A new edition in two volumes was issued in Paris, 1804–1805. His biographer, H. Vaschalde, says of him (p. 108), "Son style a cette belle rudesse du vieux Caton, la franchise et l'honnêteté d'un patriarche de Chanaam et la noble éloquence des pères de l'Eglise."

lors estant parvenu en parfaite maturité. L'on le conservé tout l'Hyver parmi du sablon delié en cave temperee; moyennant que ce soit hors du pouvoir des rats, car ils sont si friands de telle viande, qu'y pouvans attaindre, la mangent toute dans peu de temps. Aucuns ne prennent la peine de provigner ceste plante, ains la laissent croistre et fructifier à volonté, cueillans le fruit en sa saison: mais le fruit ne se prepare si bien à l'air, que dans terre, en cela se conformant aux vraies truffes, ausquelles les cartoufles ressemblent en figure; non si bien en couleur, qu'elles ont plus claire que les truffes: l'escorce non rabouteuse, ains lisse et deliee. Voila en quoy tels fruits different l'un de l'autre. Quant au goust, le cuisinier les appareille de telle sorte, que peu de diversité y recognoit-on de l'un à l'autre." *[Also quoted in Roze, pp. 117–118.]

Parmentier *[in a note in the 1805 edition of Olivier de Serres' *Theatre d'agriculture* . . .] has supposed that Olivier's *cartoufle* does not refer to *Solanum tuberosum*, but should represent the topinambour (*Helianthus tuberosus*). E. Roze (pp. 117 ff.) has justly combated this error and demonstrated that the potato solely is in question, adding that the topinambour was discussed in Europe as late as 1616. The latter species was introduced into France by Lescarbot between 1613 and 1617, and consequently could not have been known to Olivier, at least not at the time when the first edition of his work was issued in 1600. For the rest, his description of the plant is so lucid that it cannot apply to anything but the potato. A particularly interesting feature is that Olivier describes the flowers as white and on this point agrees with Clusius;[1] hence Olivier's supply may have come from the same source, and at any rate points to Italy by way of Switzerland, as is also demonstrated by his nomenclature.

In the *Dictionnaire des sciences naturelles* (vol. 32, p. 524) it is stated that potato cultivation was propagated in different parts of France at different times, from the end of the sixteenth century in Franche-Comté, Lorraine, Burgundy, and Lyonnais; in Alsace between 1714 and 1724. According to the *Dictionnaire universel d'histoire naturelle* . . . (vol. 8, p. 347), in 1616 potatoes are said to have been served at the table of the king of France, but I have no means of verifying this statement; the chances are that this rests on a confusion with the topinambour.

[1] Cf. De Candolle's observation *[p. 51]: "The potato described by these two travellers had white flowers, as is seen in some cultivated European varieties, and like the plant formerly reared by l'Ecluse. We may assume that this is the natural color of the species, or at least one of the most common in its wild state."

The botanist C. Bauhin introduced the potato into Franche-Comté and Burgundy in the beginning of the seventeenth century.[1] From this point onward documents fail us, and we are ignorant of the manner in which the potato was propagated in France during the seventeenth and the greater part of the eighteenth century. During this period, it became no more popular in France than in other countries of Europe. This state of affairs is vividly illustrated by Bauhin (1671, p. 90), when he observes: "In our country the tubers of the potato are sometimes roasted in the embers like truffles; then they are peeled and eaten with pepper. Others roast them, clean and slice them, stew them in a fat pepper-sauce, and eat them as a restorative. Others again, regard them as excellent for persons in a weakened condition and recommend them as a salubrious food. They are no less nutritious than chestnuts and carrots, but they are flatulent [after Clusius]. I have been told that the people of Burgundy have at present abandoned the use of these tubers, because they persuaded themselves that eating them will cause leprosy, and they call them artichokes of the Indies."

Solanum tuberosum is an interesting plant from a botanical viewpoint, and, thanks to the descriptive work of Clusius and Bauhin, it could not fail to attract the learned, but the people at large took no deep interest in it. General botanical works of the seventeenth century do not even mention it; thus, for instance, the *Histoire des plantes de l'Europe, et des plus usitées qui viennent d'Asie, d'Afrique, et d'Amerique* published in two volumes by Jean-Baptiste de Ville in Lyons, 1689, a copy of which is in my possession.

Toward the middle of the seventeenth century, the potato was propagated in the Vosges, according to popular tradition, by the Swedes during their invasion in the Thirty Years' War. In 1665 the potato made its first appearance in Paris. In 1749 Champiers wrote: "In general opinion, this is the worst of all vegetables; yet the people who form the largest portion of humanity subsist on it." Legrand d'Aussy (vol. 1, p. 144) comments on this passage thus: "It is true that the plant treated by this author with so great a contempt is designated by him topinambour, but he understands by topinambour what is called *pomme de terre*. For the rest, if we should claim that the true potato is what he terms truffle, of which he distinguishes two species, a red and a white one, this author's testimony would not be more favorable. In respect to this fruit he

[1] The potato is described and illustrated in his *Prodromos theatri botanici* . . . (1671, pp. 89–90).

remarks, 'It is not unknown in Paris; but it is true that it is left to the small people and that people of a certain social status think it beneath their dignity to see them on their tables.' " The work *L'ecole du jardin potager*, published in 1749 by De Combles, contains an interesting article on the potato under the heading *La truffe*, from which it appears that its cultivation had since made progress, but that it still was very far from being generally appreciated *[from Roze, p. 128]. At that time it was not only the vulgar and the country people, but also the well-to-do in the towns of most provinces who fed on potatoes, and many people had a passion for them.[1] The common people ate them cooked in ashes with a bit of salt, and in the mountains they were made into bread. In the provinces adjoining the Rhone particularly, consumption was considerable. However (the author continues) it is insipid of taste and very indigestible, but it has a certain flavor pleasing to those who like it. What objection is to be raised to this? And when one is accustomed to a thing, it will lose many of its drawbacks. It is a certain fact that this fruit is nourishing and that by force of habit it does not inconvenience those who have been habituated to it from childhood; for the rest, it is of great economic importance for the people at large, and these advantages may offset its defects.

Duhamel du Monceau, in his *Traité de la culture des terres* (vol. 5), exhorts his countrymen not to neglect potato cultivation; for, aside from its utility for all kinds of animals, it offers great resources in years of dearth for the nourishment of men. His allusion to the consumption in England, Scotland, and Ireland shows that France was behind these countries in consuming potatoes.

Turgot (1727–81) attempted to propagate the potato in the departments of Limousin and Angoumois, but public prejudice proved an unsurmountable obstacle to this innovation. *[Roze, p. 160.]

A passage in the *Encyclopédie*, published in 1765 under the editorship of Diderot and d'Alembert, is curious enough to be placed on record. It runs as follows *[cited also in Roze, pp. 142–143]: "Pomme de terre, Topinambour, Batate, Truffe blanche, Truffle rouge.—This plant which was brought to us from Virginia[2] is cultivated in many countries of Europe, notably in several provinces of

[1] Ce n'est pas seulement le bas peuple et les gens de campagne qui en vivent; dans la plupart de nos provinces, ce sont les personnes même les plus aisées des villes; et je puis avancer de plus, par la connoissance que j'en ai, que beaucoup de gens l'aiment par passion. Je mets à part si c'est affection bien placée, ou dépravation de goût; il a ses partisans, cela me suffit. *[From Roze, pp. 128–129.]

[2] This was the erroneous opinion generally entertained at that time.

the Kingdom, as Lorraine, Alsace, le Lyonnais, le Vivarais, le Dauphiné, etc. The people of these territories, particularly the peasants, make the root of this plant their most common food during a good portion of the year. They cook it in water, in an oven, or in embers, and prepare of it several coarse or rustic ragouts. People a little well-to-do prepare it with butter, eat it together with meat, or make it into baked slices, etc. However it may be prepared, this root is insipid and mealy. It cannot be classed among the agreeable foodstuffs, but it furnishes abundant and rather wholesome nutrition to men who are content to be nourished. The potato is justly regarded as flatulent, but what are winds for the vigorous organs of peasants and laborers?"

The year 1770 was the turning-point in the history of the potato in France; a terrible famine then prevailed, and potatoes proved of great help to the people. Hence the Academy of Besançon, in 1771, put up for competition the following problem: "Indiquer les végétaux qui pourraient suppléer en tems de disette à ceux que l'on emploie communément à la nourriture des hommes et quelle en devrait être la préparation?" Seven memoirs were submitted to the Academy, all being unanimous on the point that the culture of the potato was already old in the province of Franche-Comté. The author of the memoir to which the Academy awarded the prize was Antoine-Augustin Parmentier (1737–1813), a prominent agriculturist and chemist, who subsequently won laurels by promoting potato culture throughout France, and in whose honor the name *parmentière* for the potato temporarily held sway.[1] His *Examen chymique des pommes de terre* appeared in 1773, his *Manière de faire le pain de pommes de terre sans mélange de farines* in 1779, his *Mémoire sur les semis des pommes de terre* in 1786, and his *Traité sur la culture et les usages des pommes de terre, de la patate et du topinambour* in 1789. In his *Eloge historique de Parmentier,* Cuvier tells that at a certain time of the Revolution it was proposed to appoint Parmentier to some municipal post; one of the voters opposed this plan furiously and exclaimed, "He will make us eat nothing but potatoes, he it is who invented them!" (Il ne nous fera menger que des pommes de terre, c'est lui qui les a inventées!) *[Cited in Roze, p. 163.]

When a prisoner of war in Germany during the Seven Years' War, Parmentier had been fed on potatoes and then conceived the idea of recommending them to his own countrymen. On his return to

[1] The *mémoire couronné* of Parmentier was republished in a new form under the title *Recherches sur les végétaux nourrissans qui, dans tous les temps de disette, peuvent remplacer les aliments ordinaires* (Paris, 1781).

France he sought the protection of Louis XVI, who granted him permission to plant his favorites in a plot of land known as Les Sablons ("Sandy Plain") notorious for its sterility. This experiment proved a great success.

The story of his life has, of course, been embellished with many anecdotes. That he presented the king with a bouquet of potato flowers which the king graciously accepted and put in his buttonhole and that the lords and ladies quickly imitated this example, is no more than a good historiette. It is likewise an anecdote that his potato fields were guarded during the day only, that when the guards were withdrawn at night people pilfered the tubers, and that this was exactly what good Parmentier had intended and interpreted as a novel success. Shortly afterwards he feasted the celebrities of his time at a banquet, and Franklin and Lavoisier were just in time to be present. All dishes on this occasion were prepared from potatoes of the Sandy Plain; even the liquors served were extracted from them. Parmentier's greatest merit is that he shattered the insane prejudices against the potato as a human food. This he accomplished not with fulminant speeches, but through patient and painstaking work in the laboratory, proving by means of chemical analyses that the tuber does not contain any poisonous or injurious substances.

At the celebration of his centenary in 1888, a statue of Parmentier was unveiled at Neuilly-sur-Seine. Parmentier was a truly great man of noble character, and a warm-hearted philanthropist. A. F. de Silvestre says of him: "Peu d'hommes ont été assez heureux pour rendre à leur pays des services aussi importants. Un ardent amour pour l'humanité était le génie qui inspirait Parmentier; dès qu'il voyait du bien à faire ou des services à rendre, il s'animait, les moyens d'exécution se présentaient en foule à son esprit et ne lui laissaient plus pour ainsi dire de repos; il sacrifiait tout pour satisfaire cette passion; il interrompait les études qu'il aimait le mieux pour s'employer en faveur des infortunés."

I do not agree with the modern efforts of his countrymen, Clos and Heckel, to belittle his merits. It may very well be that, as stated by Clos, the potato was grown in northern France prior to the middle of the seventeenth century (Velay, 1735; Nancy, 1764; Lyonnais, 1771; Haute Garonne, 1776; Dauphiné, 1787) but this does not alter the fact that Parmentier recognized its value as a famine food and pushed its cultivation far ahead. Heckel *[p. 114, footnote 1] even goes so far as to say: "Clusius was a modest scholar, a silent worker,

whereas Parmentier, who carried out the work of Clusius, was a courtier of the court of Louis XVI, and, thanks to his artifices, understood to dominate public opinion and to curry favor with the public." This comparison is lame and unfair. Clusius assuredly was a fine scholar and a great botanist, and it remains for all time his indisputable merit that he propagated the potato in central Europe and gave a powerful incentive to further research through his lucid description; but he did not recognize its great economic importance, which, after all, was impossible in those days when the potato had just arrived in Europe. For nearly two centuries its cultivation remained in an experimental stage; it was grown almost everywhere without being appreciated. It remained for Parmentier to devise scientific methods of cultivation and preparation; he was not a fanatic, but a serious and indefatigable research worker who wrote a long series of valuable books on agronomic and economic questions. It takes more than a "courtier" to accomplish what he did.

During the nineteenth century potato culture in France gained a larger extension from year to year. Compared with a cultivated area of 4,500 hectares in 1789, in 1892 there were 1,512,136 hectares grown with potatoes. The annual harvest in France now amounts to 136,000,000 centners, representing a value of 600 million francs.

THE POTATO IN GERMANY, SCANDINAVIA, AND EASTERN EUROPE

The potato entered Germany from Italy and was chiefly propagated by the activity of the botanist Clusius, who states that in his time it had become rather common in most gardens of Germany, since it is so fertile *[1601, p. lxxx]. As Clusius received the first tubers from Philippe de Sivry in 1588, when he was in Vienna, this date may be regarded as that of the first introduction of the potato into Germany and Austria. In the last decade of the sixteenth century it was accordingly known there as a garden plant. The fact that the Germans erected in 1853 in Offenburg, Baden, a monument to Sir Francis Drake as "introducer of the potato into Europe in the year of our Lord 1580," figured by Safford (1925, fig. 6, p. 123), is a double absurdity: first, there is no documentary evidence for Francis Drake's having introduced the potato into England; second, there is no historical connection between the introduction of the potato into England and into Germany. The potato was not introduced into Germany from England, but from Italy; and if any one deserves a monument with reference to this event, it is Clusius.

In the same manner as in England, the potato was first grown in gardens of Germany as a curious exotic plant, and the tubers were not utilized as an article of food. The botanists—above all, Caspar Bauhin (1560–1624), Professor of Anatomy and Botany at Basel, who, as mentioned, conferred upon it the name *Solanum tuberosum*—were well acquainted with the plant. P. Ammann (p. 124) calls it *Solanum esculentum tuberosum* and still retains the name *taratuffli* inaugurated by Clusius.

P. Lauremberg of Rostock (p. 136) speaks of potatoes under the names *Adenes Virginiani* and *Halicacabus glandifer*, saying that he calls them Virginian because Virginia is their native country(!), although subsequently they were imported from Peru in large quantity, so that they might also be termed *Peruviani*.

The development of potato culture in Germany is largely bound up with famines, wars, and Prussian militarism. The misery of the Thirty Years' War contributed much to the advance of potato plantations. Frederick William, the Great Elector, is said to have ordered potatoes to be planted in the Berlin Lustgarten in 1651. About the same time they were raised in Baden, Franken, Brunswick, and Westphalia; in Saxony about 1680 in the villages around the Kapellenberg, in the southernmost part of the kingdom

(E. Johnson). As everywhere, many insignificant places have their own local history as to the first introduction of the useful tuber, but these purely local and geographically limited affairs are devoid of general interest. Thus, in 1920, when I stopped for a few days at Braunlage in the Upper Harz Mountains, I was shown among other local curiosities an iron tablet inserted into a huge monolith and known as "Kartoffel Denkmal." The inscription on the tablet, erected in 1885 by "late posterity" (posterity is usually late in acknowledging good deeds), glorifies as the founder of potato culture in the Upper Harz, Johann Georg von Langen, headmaster of the hunt (Oberjägermeister), born at Oberstedt in the county of Henneberg in 1699 and deceased at Jägersborg near Copenhagen, Denmark, in 1776. In Old Bavaria, potato culture was inaugurated in 1701, in Baden and around Bamberg in about 1716, in the Upper Palatinate in 1724, and around Nuremberg about 1730 (K. von Guttenberg).

Frederick the Great (1740–86) took coercive measures in propagating potato culture in Pomerania and Silesia. In 1744 he had seed potatoes distributed gratuitously and compelled the peasants to cultivate them. It was a truly militaristic procedure backed up by royal decrees and dragoons to enforce them. During the Seven Years' War (1756–63) and the famine of 1770, the advantages of the new crop became apparent. Up to that date potatoes had been used almost exclusively as cattle forage in many parts of Germany. However, only from 1780 was the cultivation carried on on a large scale, and only during the nineteenth century did the potato become a popular and indispensable article of food. In 1913 almost three and a half million hectares, that is, nearly one-eighth of the total cultivated area of Germany, was planted with potatoes and yielded over fifty-four million tons of tubers.

The potato was introduced into Norway as late as the middle of the eighteenth century, probably from England or Scotland. The first who, according to documentary evidence, engaged in potato culture was a probst named Atke. The story goes that in 1758 he brought along potatoes (presumably from Laerdalen at the end of the Sognefjord, where he previously functioned as a parson) and planted these in the garden of his parsonage, Ullensvang at Hardanger. In the same year he made a present of about a "hatful" of potatoes to his friend, the preacher P. H. Hertzberg, in the southern part of Bergen Stift. This gift presumably laid the foundation for the further dissemination of the plant in the western and southern portions of the country. Hertzberg endeavored to extend

potato culture generally in his parish so successfully that, according to official data, an annual average of 9,531 tons of potatoes was forwarded during the period 1798–1802 to Bergen from the Vogtei Sondhordland, where he lived.

As late as 1770 the potato reached Throndhjem. In southern and eastern Norway the cultivation progressed very slowly, and in the beginning of the nineteenth century, as Schübeler was assured by trustworthy men, potatoes were raised in but small quantities, if at all, in those parts of the country.

During the last six years of the union with Denmark (1808–14), Norway was entangled in the war against England, when the importation of cereals stopped; this event may have contributed to the promotion of potato culture in the whole country. In 1816–17 potatoes began to be used for the production of alcohol. The potato advances farther to the north than barley (70° N. lat.). It is advantageously grown in Finmarken, in places where even barley does not thrive. (After Schübeler, pp. 90–91.)

The potato was introduced into Sweden in 1725 by Jonas Alströmer. Its cultivation became general after the promulgation of a royal edict in 1764.

The Slavic nations, as is shown by their terminology (p. 104), received the potato from Germany in the latter part of the eighteenth century. The form *kartofel* in Russian and Polish can be but a recent loan, as it was not common in Germany until the middle of the eighteenth century. The Russian government encouraged potato culture by distributing awards to the peasants.

In Montenegro the potato (*krtola*) was introduced by the Wladika Peter Petrovich I (1781–1830). (Wittmann, who refers to *Wiener landwirtschaftliche Zeitung*, 1916, p. 250.)

In Greece potato culture was promoted when Prince Otto of Bavaria was elected king of the country in 1833.

THE POTATO IN CHINA

Unlike the growing of maize or tobacco, potato culture is not a universal phenomenon. The Asiatic world has not yet cast its vote in favor of the potato, but treats it indifferently or even disdainfully. The assertion of Sanders (p. 2) that "in China they [potatoes] are cultivated, but not extensively, owing to the slow progress which everything new makes in that country" misses the mark. This allegation conflicts with the fact that the Chinese have unhesitatingly adopted many other American plants during the last centuries (not to speak of the numerous plants received from different quarters in far earlier epochs) and with the still more significant fact that the Chinese are not the sole objectors to the potato, but are joined in their attitude by the Japanese, the natives of the Philippines, the peoples of India, and the Arabs.

The problem, accordingly, is deeper and calls for serious attention. Obviously, all these nations of Asia are not merely obsessed by a prejudice, but must have reacted on this point for identical reasons, without any consciously concerted action on their part. These reasons, then, can only be sought in the system of nutrition that prevails among these peoples, in which the potato has no place or is not a vital necessity.

In a vein similar to Sanders, Sir J. F. Davis (vol. 2, pp. 331–332) wrote, two generations earlier: "Under all the circumstances, it is very surprising that the potato should have made so little progress as an article of cultivation and food since its first introduction at Canton. Nothing indeed could more convincingly demonstrate the strength of Chinese prejudices than their indifference to that, as well as to other European vegetables, as cabbages, peas,[1] &c., which, with the potato, have been cultivated at Macao for half a century. The rice-fields near that place are, during winter, converted to the growth of kitchen vegetables, including potatoes; but these are mainly for the supply of the European and native Portuguese population. Even the shipping near Canton is supplied with potatoes from Macao, where they are sufficiently abundant and cheap; but at the former place their use is not extensive enough to have reduced their price. It is probable that from climate, soil, or other

[1] This is erroneous. *Brassica* and *Pisum sativum* have been cultivated in China for a long time (cf. Laufer, 1919, pp. 305–307). The Chinese are great cabbage-eaters.

causes, joined to the ancient prejudice in its favor, rice will long continue to be preferred as an object of cultivation."[1]

Potatoes are now grown in China a little almost everywhere, but the cultivation is neither intense nor ubiquitous.[2] They are relished chiefly by the indigent mountain-dwellers. In Szechwan and Yünnan they are cultivated and consumed chiefly by the aboriginal tribes. Major H. R. Davies (p. 233) justly says: "It is usually only among hill tribes that one is occasionally able to get this vegetable. The Chinese do not seem to appreciate it, though it grows well in the few places where it is cultivated."

The potato is not mentioned by any early European writer on the botany of China. The earliest allusion to it is made by the Hollander John Struys, who visited Formosa in 1650 and mentions the potato among the products of the island (Campbell, p. 254). There is a casual reference to it in a letter of James Cunningham written in 1700 or 1701 with respect to the Island of Chusan (in Chinese Ting-hai *[定海]) in the Chusan Archipelago *[lying off the city of Ningpo in Chekiang] (Bretschneider, 1880, p. 40). It is not pointed out in the *Pên ts'ao kang mu* 本草綱目 of the end of the sixteenth century, or, as far as I know, in the *Pên-Ts'ao* literature subsequently published, perhaps for the reason that the foreign potato was never employed in the materia medica.[3]

The history of the potato in China is fundamentally different from that of the batata. The potato, so to speak, was forced upon China, and arrived much against the will and wish of the people,

[1] I do not see how the Chinese can be blamed for preferring rice to potatoes—so do I. This is not based on prejudice, but on sane economic reasoning and an instinctive feeling for food values. Compare the two in the following table:

	Albuminoids in grams	Fat	Carbohydrates	Fuel value in calories
Rice	67.2	9.0	661.9	3,073
Potato	2.3	0.2	24.1	110

[2] The statement by Ratzel (vol. 2, p. 669) that maize and potatoes are now grown all over the empire and form an important staple food of the people in the mountainous regions is not quite to the point. Maize, which occupies a wholly different place in Chinese economy, cannot be treated on the same level as the potato. Potatoes, in fact, do not appeal to the Chinese, but, on the contrary, are much despised by the majority of the people, being but seldom eaten, since there are many substitutes like various species of *Dioscorea* and batatas. In the proximity of the treaty ports, potatoes are raised for the use of foreigners.

[3] F. P. Smith (p. 178) asserts that the *Pên ts'ao* speaks of a tuber under the name *t'u yü* 土芋, "which is in all probability the common foreign potato, then not well known." However, the *t'u yü* of the *Pên ts'ao kang mu* (for this is the *Pên ts'ao* meant by him) refers exclusively to the indigenous *Dioscorea;* the very name signifies "native taro." The potato, in fact, is not mentioned in that work, any more than other American plants which were introduced in the Wan-li period.

who looked upon it without enthusiasm. "It offers food only for the poor; the rich think it is a disgrace to eat it." (Richthofen, vol. 2, p. 174.) It has never affected their agricultural economy deeply, and, unlike maize or the sweet potato, it offers no continuous and logical history. Its history is not national, but purely local; it is split into a series of incoherent efforts of sporadic and isolated character. For this reason no absolute date can be fixed for its introduction.[1]

*[The earliest Chinese reference to the potato so far discovered appears in the Gazetteer of Sung-ch'i hsien 松溪縣志 (Fukien) in an edition of 1700.[2] The description there given of *ma ling shu* is as follows (ch. 6, p. 2a): "Horse's-bell yam: a vegetable which grows near trees and must be dug up. In appearance it is somewhat like a bell, and there are both little and big ones. It is dark and round, and of a bitter-sweet taste."

Since John Struys found the potato growing in Formosa in 1650, coastal Fukien would be the natural region for its introduction on the Chinese mainland. It is somewhat puzzling, however, that the potato should be first noted in Sung-ch'i hsien, which is not on the seacoast, but in the extreme north and west of the province near the southwestern border of Chekiang. That James Campbell simultaneously observed the potato just off the coast of Chekiang near Ningpo suggests that it may have been growing in several scattered areas in the two provinces by 1700.]

The first and best botanical description of the potato in Chinese literature is contained in the *Chih wu ming shih t'u k'ao* 植物名實圖考 (ch. 6, p. 33) published in 1848 *[*read:* preface dated 1848; published 1866] by Wu Ch'i-chün *[吳其濬]. It is accompanied by a tolerably good sketch of the plant (reproduced in Fig. 6). It is described under the name *Yang yü* 陽芋 ("taro of Yang"), which, however, is

[1] *[Likewise, a great confusion between the potato and the sweet potato existed in the minds of early Chinese writers on the subject. The earlier introduction of the sweet potato, together with its wider acceptance, led to the application of sweet-potato terminology to the potato. This confusion in terminology cannot be solved arbitrarily: see further notes and the discussion of the potato in Japan, especially page 82.]

[2] *[This information is kindly supplied by Dr. L. C. Goodrich of Columbia University, who investigated the problem while in China during 1937. Wan Kuo-ting 萬國鼎 of Nanking, the leading student of Chinese agricultural history, is his authority for the statement that this is the earliest reference to the Irish potato in Chinese literature. Dr. Goodrich found the text in a 1928 reprint of the 1700 edition in the Municipal Library of Foochow, and made a transcript of the passage as follows: 馬鈴薯葉依樹生掘取之形有小大略如鈴子色黑而圓味苦甘]

not explained by the author (see below, p. 74); as a colloquial name he gives *shan yao tan* ("mountain medicinal-herb egg"). In regard to its distribution he says that it occurs in Kweichou and Yünnan and that in Shansi it is raised as a field crop; the people living in the Chung-nan Mountains 終南山 near Hsi-an fu, Shensi, plant it, and the well-to-do among them annually harvest several hundred catties. The leaves are described as being of various shapes, large or small, distant or close, long or round. The tubers are compared with those of *Ipomoea batatas* (*fan shu*) and in taste resemble taro, but are sweeter; also they resemble *Dioscorea*, but are more insipid. Above all, the Chinese botanist has clearly recognized the economic importance of the tubers, which he regards as a storage crop of the poor in staving off famine and rescuing them in times of dearth; potatoes are useful in soups and broths, may be baked and roasted, and offer many advantages.[1]

In the Gazetteers published during the eighteenth and nineteenth centuries, the foreign potato is occasionally and sporadically mentioned. According to the Gazetteer of Tung-a 東阿 (in the prefecture of T'aian *[泰安], Shantung province), "the potato in two varieties, a red and white one, has come on foreign vessels. In the seventeenth year of the period Ch'ien Lung [1752] every district of the empire received an imperial exhortation to plant potatoes on high hills and in sandy soil. Their cultivation is very easy, and they furnish a good means of subsistence." (Ch. 2, p. 32b.)[2]

In the subprefecture Ting-yüan *[定遠] in the prefecture of Han-chung *[漢中], Shensi Province, according to the local chronicle, "there are four varieties of potato—red, white, yellow, and black. It thrives in the high mountains; it is fond of dry places, but dreads water. It may be taken with rice or used as a vegetable." (*Ting yüan t'ing chih*, ch. 8, p. 1b.)[3]

[1] 陽芋 陽芋黔滇有之綠莖青葉葉大小疎密長圓形狀不一根多白鬚下結圓實壓其莖則根實繁如番薯莖長則柔弱如蔓蓋卽黃獨也療饑救荒貧民之儲秋時根肥連綴味似芋而甘似薯而淡羹臛煨灼無不宜之葉味如豌豆苗按酒侑食清滑雋永開花紫筒五角間以青紋中擎紅的綠蘂一縷亦復楚楚山西種之爲田俗呼山藥蛋尤碩大花色白聞終南山氓種植尤繁富者歲收數百石云

[2] 番薯有紅白二種來自番舶自乾隆十七年各州縣奉文勸種於高阜沙土地依法種植最易生成啗之可以代食 *[The use of the term "fan shu" 番薯, which merely means "foreign tuber," makes this citation suspect, since it is one of the most common names for the sweet potato. However, the term may have been used for both plants, and cannot be ruled out completely.]

[3] 洋芋有紅白黃烏四種宜高山喜旱畏潦作飯作菜皆可

FIG. 6. Sketch of potato plant. (From the *Chih wu ming shih t'u k'ao* by Wu Ch'i-chün, who gave the best Chinese botanical description of the potato.)

Some Chinese Gazetteers speak also of potato flour; for instance, that of Chu-shan hsien *[竹山縣] in the prefecture of Yün-yang *[鄖陽], Hupei (*Chu shan hsien chih*, ch. 6, p. 1b); and that of Ning-shan t'ing *[甯陝廳] in the prefecture of Hsi-an *[西安], Shensi.

It is interesting to note that in some cases the old editions of the Gazetteers make no reference to the potato, but that it looms up in the new editions. This fact is mentioned expressly, for instance, in the new Gazetteer of the district P'ing-li 平利 (in the prefecture Hsing-an *[興安], in the southern part of Shensi Province), published in 1897, which says (ch. 9, p. 1) that the old Gazetteer did not contain any reference to the potato, and then cites an oral tradition to the effect that "a certain Marquis Yang 楊侯, when engaged in an attempt to exterminate brigands, induced his soldiers to collect potatoes for distribution among the poor inhabitants of the high mountains, who then commenced to plant this tuber, popularly called *Yang* 楊 *yü* ['taro of Yang']. Others, however, maintain that during the period Ch'ien Lung (1736–95) Yang, while holding office in Kuangtung, brought potatoes back from abroad, where he had purchased them, but that nothing is known as to who he was."[1]

The Gazetteer of Hsiao-i t'ing *[孝義廳] in the prefecture of Hsi-an, Shensi Province, contains this information under the heading *yang yü* ("foreign taro"): "According to an oral tradition this species was brought along from the western ocean [i.e. Europe] by his Excellency Yang in the time of the Chia Ch'ing era (1796–1820). The people living in the high mountains make this plant their principal food." (*Hsiao i t'ing chih*, ch. 3, p. 8b.)[2] Here, accordingly, we meet the same tradition as in the Gazetteer of P'ing-li, save that the lifetime of the alleged Yang is dated at a later period.

In my opinion, this Mr. Yang, about whom nothing is known, is a fictitious person, invented by the rustic population of Shensi in order to account for the why and whence of the foreign plant. It is quite obvious that the name Yang is based on or elicited by the word *yang* 洋 ("ocean," "oversea," "foreign"), both having the identical tone (even the writing 陽 occurs).[3] The fact, however, remains that

[1] *[The text for this citation is not found among Dr. Laufer's notes, nor is the original work available in Chicago.]

[2] 洋芋俗傳此種係嘉慶時楊大人自西洋帶來高山民以此主食

[3] A. Tafel (vol. 1, p. 92) reproduces a story which he asserts he heard in Lan-chou, Hsi-ning, and Kuei-hua. During a war of the Mohammedans in Turkistan the Chinese General Yang (he apparently means Yang Yü-ch'un 楊遇春, 1760–1838, viceroy of Shen-Kan *[陝甘]) was hard pressed. He and his soldiers were held in the mountains without food. His men rebelled and threatened

in certain localities of Shensi potatoes were grown and consumed by the poor mountaineers as early as the eighteenth century.

They are also cultivated in the mountains near Peking.[1] "In Shantung, potatoes have been successfully introduced of late in many places through the influence of foreigners." (Burt, p. 382.) Excellent qualities are said to be raised in Manchuria (Hosie, p. 195), where the crops are ubiquitous; on the largest scale they occur north and west of the Sungari (Pozdnieev, p. 439). At Kuei-te in Kansu, Rockhill (1894, p. 90) reports that good potatoes sell for six or seven cash a pound. He also notes potatoes among the principal crops in the valley of Tai-chou in Shansi (1895, p. 765).

A. Henry (p. 281) mentions *Solanum tuberosum* under the name *yang* 洋 *yü* as cultivated in the mountainous districts of Szechwan. In the Min Valley of Szechwan they are met with at intervals for non-Chinese consumption (Jack, p. 87).

Among the Miao-tse we even meet veritable potato-addicts. E. H. Parker (pp. 287–288) gives a humorous illustration thereof in the example of an intelligent old lady, who had a fine cat, a fine female servant, and a fine dog; and neither she, her dog, nor her cat ever ate anything but potatoes; no meat, no rice, no vegetables, no tea—potatoes and water for woman and beast all the year round. The Tibetan tribes inhabiting western and northwestern Szechwan are all acquainted with the potato and cultivate it to some extent. The plant is expressly mentioned in almost all Gazetteers of these districts, written by Chinese officials; most of those still in manuscript are kept in the Yamens.[2] In these Gazetteers the potato is called 羊 (instead of 洋) 芋. The *Sui ching t'un chih* 綏靖屯志 *[in Sinkiang?], printed in four volumes in 1825 and prefaced by Wang Ch'üan 王荃

to slay him unless they could get something to eat. In this predicament he noticed how his horse scratched up some tubers from under the soil. He urged his soldiers to taste these, and they were found eatable. They were potatoes, which were hence called *Yang yü*. There is no doubt that the details of the tradition have not been understood correctly by Tafel. Moreover he regards this yarn as historical, for he identifies his alleged Yang with Yang who conquered Kashgaria in the beginning of the nineteenth century. At any rate, Tafel's version shows again that the whole story and this personage Yang are a figment. Tafel's own view is that potatoes were introduced into northern China by Catholic fathers about forty years ago. "The refusal of acknowledging the merits of foreigners is a typical quality of the Chinese," he concludes his sermon. This is a rather sweeping generalization. And what are the merits of the "foreigners" in regard to the potato? The "foreigners" simply owe this cultivation to the South American Indians, and most of them hardly ever remember this fact.

[1] Bretschneider (1876, p. 18). A. Favier (p. 379) writes that thirty years ago only the yellow variety existed, but that, since then, the missionaries have introduced the good varieties of Europe, which were welcomed as more productive.

[2] Of several of these I had occasion to take copies during my travels (1909).

and Li Han-yüan 李涵元, adds a new name, *chan* 鸇 *yü*,[1] which I have not traced in any other text. The word *chan* denotes a sparrow hawk with a light grayish plumage, and perhaps the color of the plumage is compared with that of the potato skin; but this is merely an opinion.

"Irish potatoes are much grown in Se-ch'wan, and are of excellent quality, free from insects and blight. When or how they were introduced into Western China is unknown; but on Mount Omei, eleven thousand one hundred feet above the sea, the priests raise excellent potatoes by the American method, keeping them free from weeds and in regular hills. The potato is now the chief winter vegetable used on this sacred mountain." (Hart, p. 55.)

"Our priest was very industrious with the hoe and sickle. Every day after prayers he put on his large bamboo hat, short coat, and heavy boots, and strolled down to his potato patch. He owned a farm-house in the hollow at the foot of the first slope, and around it had an acre of Irish potatoes in full bloom, seeming as much at home as in Erin itself. They were planted in rows and hills, just as in New England, and seemed to be the staple vegetable on top of the mountain; there were turnips, spinach, and a few cabbages near the temple, which were placed at our disposal, but the main dependence seemed to be upon potatoes." (*Ibid.*, p. 246.)

E. H. Wilson (vol. 2, p. 58) writes: "In the mountainous districts [of Szechwan] the sweet potato is displaced by the Irish potato, or 'Yang-yü' (*Solanum tuberosum*), which, like maize, is another plant of American origin that has become a most important crop. It was introduced by the Roman Catholic priests at the time of a great famine some forty odd years ago. Its culture has spread

[1] This is derived from a work *I pu fang wu lüeh chi* 益部方物略記. *[Dr. Laufer does not cite the text of the *Sui ching t'un chih*. The *I pu fang wu lüeh chi*, from which the term *chan yü* is taken, is a Sung work by Sung Ch'i 宋祁 (A.D. 998–1061). Dr. A. W. Hummel, Chief of the Division of Orientalia, Library of Congress, has kindly supplied the text of the *I pu fang wu lüeh chi* dealing with *chan yü:* 芋種不一鸇芋則貴民儲於田可用終歲(注)蜀芋多種鸇芋爲最美俗號赤鸇頭芋形長而圓但子不繁衍 This reads: "There are several kinds of taro; *chan yü* is the most valuable. People store it up in the fields; it can be used the entire year round." The commentary states: "There are many kinds of taro in Szechwan of which *chan yü* is the most delicious. In the vernacular it is called *ch'ih chan t'ou yü* ['red sparrow-hawk head taro']. Its shape is long and round; but the seeds are not very prolific." The term *chan yü* is accordingly much older than the introduction of the potato to China. It may, however, have been borrowed from the Sung work by the author of the *Sui ching t'un chih* to describe the exotic potato; again, some entirely different plant may be under consideration. This point cannot arbitrarily be determined without the original text consulted by Dr. Laufer.]

enormously, and though it is despised by the rice-eating Chinese of the plains it has become a staple article of food with the highland peasantry. In the valleys it is cultivated as a late winter crop, in the mountains as a summer crop. Its culture is unfortunately but little understood; it is always grown too thickly, and seldom if ever properly earthed up. Both red- and white-skinned varieties are grown, but the flavour is usually very poor. The potatoes cultivated by the Buddhist priests on Mount Omei are justly celebrated, but the best I ever ate in China were grown by Sifan tribesfolk around Sung-p'an."

The Lolo of Szechwan and Yünnan are acquainted with the potato and style it *ts'i dlaima* ("European taro") (Vial, p. 264). In the A-hi dialect of the Lolo language the potato is called *ya-yi*, which is derived from Chinese *yang* 洋 *yü* (Liétard, p. 556). In the whole territory inhabited by the Lolo the potato is perfectly acclimatized, and is grown in all mountains of the Chien-ch'ang; it is also planted there by the Chinese (Legendre, p. 342). E. Rocher (vol. 2, p. 11) emphasizes the abundance of potatoes in the province of Yünnan, while J. Anderson (p. 93) observes: "Potatoes appear to be largely cultivated in Western Yunan, and many fields were devoted to them about Momien, where they are reared and planted out in the same way as in England. They were quite as good as English potatoes, and in great vogue among the Chinese, and 3½ lbs. are sold for four pence. The leaf is slightly smaller than the home plant, and the tubers have a thin red skin. They had nearly finished flowering by the beginning of June. Nothing could be learned regarding the history of their introduction."[1] Red and white potatoes are cultivated at Amoy (Brown, p. 735).

From the preceding notes it will be seen that the opinion prevalent among European writers with respect to the introduction of the potato is that the event is of recent date and is due to Catholic

[1] This is by no means surprising. On page 321 the author comments that "the existence of celery here is almost quite as remarkable as that of the potato. Both plants have been in all likelihood introduced by the Chinese trading up the Irawady via Bhamo, but where and when they were obtained, and how the cultivation was learned, are subjects for conjecture, as the inhabitants could give me no information." The former owner of my copy of Anderson's work penciled on the margin here, "French missionaries of Se-ch'wan and Yün-nan." This supposition would seem permissible, and it may be that many missionaries from both Europe and America have introduced potatoes to their stations; but such individual and sporadic efforts could hardly account for the wide dispersion of the plant, especially among the remote and secluded mountain tribes hardly ever visited by missionaries. It is erroneous to believe, however, that potatoes were originally and exclusively introduced into China by French missionaries (H. R. Davies, p. 233), or by the Jesuits of the eighteenth century, as conjectured by F. von Moellendorff

missionaries;[1] and the chronological definition "forty years ago," like a rubber stamp, runs through several books. The statement itself is not to be questioned, and in some localities the potato may very well have been introduced by missionaries, and even only forty years ago. I am perfectly willing to go so far as to concede that almost every missionary in China has at a time introduced his own potatoes; this is not at all astounding and has been done by missionaries in the South Sea islands, Africa, and the world over. This recent activity, however, does not explain the entire history of the potato in China, nor does it render justice to its early appearance in the seventeenth and eighteenth centuries. The potatoes, for instance, which John Struys in 1650 records for Formosa (Campbell, p. 254), assuredly cannot be attributed to missionary effort. Here again we may have to look to Chinese initiative directed toward the Philippines, as in the case of the batata and the tobacco plant. Although details are lacking, this view appears altogether sensible. For the rest, both Chinese records and nomenclature of the plant stamp it as a foreign introduction, and a certain "barbarous" odor remains attached to it.

Another theory has been propounded to the effect that the potato may have been introduced or reintroduced by the Hollanders (F. P. Smith, p. 178; J. Dyer Ball, p. 585; S. Couling, p. 456). This notion is merely derived from the designation *Holan shu* ("Holland Dioscorea"), but is not supported by any document. It is possible, of course, that the Hollanders brought the potato to Formosa, but the Chinese records relative to the island are reticent as to this introduction, nor do the Dutch documents concerning the Dutch settlement on Formosa contain any reference to this effect. *[Dr. L. C. Goodrich of Columbia University substantiates this view in a letter which reads as follows: "Dr. J. J. L. Duyvendak has written that he knows no work which makes the Dutch responsible for the introduction of the potato into China, asserted by E. Bretschneider (1871, p. 224). In fact he and his colleague, the professor of botany at Leyden, think it quite out of

(p. 18), or, as it is expressed by A. Tafel (vol. 1, p. 92) in 1914, that they were imported into northern China by Catholic fathers about forty years ago. As regards Yünnan, it may be that, as intimated by Anderson, importations have taken place from Burma; but, on the other hand, the fact that the Kachin of Burma denote the potato as *yang yi*, which is borrowed from Chinese *yang yü*, would rather lead me to believe that it entered Upper Burma from China. In regard to celery, see Laufer, 1919, page 402.

[1] The Abbé Armand David (vol. 1, p. 181) points out the recent introduction of the potato, but is silent as to missionary activity.

the question."] It will be noticed below that the theory of a Dutch importation looms up among Japanese scholars likewise, but here again it is based solely on the name *Jagatara-imo*, which means "Batavia tuber."

A peculiar theory has been advanced by J. Edkins (p. 22), who argues that potatoes came to China, like maize, over the central Asian route; they "are spreading in highland China with unexampled rapidity, just as they did in Ireland at a time when the people of that island grew in a few decades from two or three millions to eight millions, and the relief of emigration was required to reduce the too great pressure on the means of subsistence." It is not very probable that potatoes reached China by way of central Asia; there, as well as in Persia and India, they are of recent date, and Edkins' speculative thought lacks any foundation.

It is not very likely that G. A. Stuart's opinion (p. 413) that the potato "was known and eaten by the people of the Liang dynasty," which ruled from A.D. 502 to 556, will find many adherents. This assertion is prompted by a confusion with a species of *Dioscorea*.

THE POTATO IN JAPAN AND KOREA

In Japan potatoes are at present cultivated chiefly in Hokkaido and in the mountainous districts to the north and northwest of Tokyo. From the eighteenth century we have a brief notice by Thunberg: "Les jardins japonais produisent un grand nombre de légumes et de plantes potagères de l'Europe; les patates qui croissaient ici sur la pente des montagnes, et dans les environs des villages, sont une des racines dont cette nation fait le plus de cas. On a également essayé à cultiver les pommes de terre, mais elles n'y ont pas réussi."[1] (1794, pp. 318–319; cf. also 1796, vol. 4, p. 55.) Thus, according to Thunberg, attempts were made in Japan to cultivate the potato, but these experiments were unsuccessful.[2]

Dr. T. Tanaka has kindly sent me the following valuable information on the early history of the potato in Japan: "Our knowledge of the history of the introduction of the common potato (*Solanum tuberosum*) into Japan is very scanty. S. Tanaka (p. 154) and T. Itō (1911, p. 487) trace the date of it to the Keichō period (1596–1615). Itō's conclusion, as well as that of a great many others, is based on the supposition that the name *Jagatara-imo* ('Batavia tuber') is suggestive of a Dutch importation of the plant. He says, 'As Formosa was occupied by Holland in 1598, and the Dutch ships first set out to trade with Japan in the year 1609, the importation must have taken place not much later than that period.' If, however, this really is the case, his definition of the Keichō period should necessarily be restricted to the years 1609–15. It is hardly justifiable to assign this obscure event to such a definite period without falling back upon any reliable record. C. Takano, in his celebrated treatise on buckwheat and common potato (*Ni butsu kô* 二物考, issued in 1836), also advances a similar opinion resulting from the prevailing common names *jagatara-imo* and *appura*, the latter, as he thinks, being the abbreviation of the Dutch name *aardappel*.

[1] Thunberg was professor of botany at the University of Upsala.

[2] *[A much earlier Western writer, Captain Richard Cocks, who was chief of the English Factory at Hirado in Japan from 1613 to 1621, wrote in his diary on June 19, 1615: "I took a garden this day and planted it with potatoes brought from the Loo Choos, a thing not yet planted in Japan." (M. Paske-Smith, p. 58.) Dr. Laufer, however, considered that this referred to the sweet potato, which at that time was called the potato. See page 103. Fuller data on Cocks will appear in the monograph on the sweet potato.]

"It is a rather curious fact that in early times the plant was mostly cultivated in the mountainous parts of Japan, as shown by Takano in the passage, 'They say the plant has long been known in Kai province.' Further, in Shinano, Hida, and Kōzuke, the plant is variously called *Kōshū-imo* ('Kai potato'), *Zenkōji-imo* ('Potato of the Zenkō Temple,' in Shinano), etc. (Ito, 1911, p. 487.) It is not very well known from Nagasaki as a food-plant, and hardly used otherwise than 'for distillery and for making *miso* (soy-bean mash).' (Kōno, ch. 5, pp. 9–10.)

"Aside from the opinion as to the so-called Dutch importation, we have but one earlier date given by Shirai (p. 24), who states that '*Nankin-imo* 南京芋 was introduced into Nagasaki in the fourth year of the period Tenshō *[天正] [1576] of the same Emperor (Ogimachi)'; and to this plant-name he refers *bareisho* 馬鈴薯 in his Index of plant-names (p. 1). However, he does not quote his source of information for this passage.

"We do not know at all who first applied the Chinese name *bareisho* (*ma ling shu*) to *Jagatara-imo*, and which is the first Japanese work that mentions the common potato. We know only two kinds of potato before the Meiji era, which is a rather weak foundation for supposing that there should have been more than one introduction.[1]

"The common potato is now an important crop of Hokkaidō Island (Hokkaidō Agricultural Experiment Station, Bull. No. 7, *passim*)."

It will thus be seen that, in the same manner as the Chinese, so also the Japanese do not possess any positive or specific record as to the introduction of the potato, but that they generally regard it as a foreign intruder and designate it by names which plainly betray an origin from abroad.

*[Dr. Shio Sakanishi, of the Division of Orientalia, Library of Congress, has very generously contributed the following notes on the potato in Japan, which amplify Dr. Laufer's remarks.

"The potato (*Solanum tuberosum*) was first introduced to Japan, according to Fujimaki, during the Keichô period (1596–1614) by the Dutch traders from Jacatra, the present Java. Hence it was called in Nagasaki *Jagatara imo* 咬噹吧薯 ('Jacatra potato') or *Oranda imo* 和蘭薯 ('Holland potato'). The Japanese did not seem to have

[1] The statement of Iwasaki Tsunemasa (ch. 2, p. 10b) confirms the existence of a variety with "pale pinkish skin," which differs from the "white" variety considered by Makino (p. 244) as the only form known before the Meiji era. Satō (p. 78) also distinguishes these two forms in a very clear passage, where he says: "There are two kinds, white and pale pink."

cared for its taste particularly, but thought the plant attractive. 'Its pale purple flower with yellow center, fleshy chrysanthemum-like leaves, and the fragrant plant' together with its newness caught their fancy and it was cultivated as a garden plant [*ibid.*]. In fact even today the potato and its flowers to the Japanese are not such prosaic things as an average Westerner thinks. For example, there is an anthology in the classical form of Japanese poetry entitled *Bareisho no hana* 馬鈴薯の花 ('Flowers of potato').

"During the Tenwa era (1680–1683) after a succession of flood and famine, the Japanese found, according to T. Ito [1908], that the potato made good cattle feed, and since it would thrive in a colder climate and less fertile soil than the sweet potato, they began to cultivate it assiduously. Kai, Hida, Shinano and other mountainous northern provinces benefited by this new discovery. Especially in Chichibu District, Musashi Province, a magistrate by the name of Kawahara Shôdayû 河原清太夫 taught and encouraged the peasants to cultivate it; hence in this locality the potato was known as the *Shôdayû imo*. Kaibara Ikken 貝原益軒 (1630–1714) in his *Yamato honzo* 大和本草 ['Japanese herbals'] (bk. 5) and his *Saifu* 菜譜 ['Garden vegetables'][1] made an attempt to distinguish between the sweet and the newly introduced Irish potato. The former (*sic*) he called *Ryukyu imo* 琉球薯 since he believed it was brought over from the Ryukyu Islands to Japan in the early part of the 17th century. The latter (*sic*) he called *kansho* 甘薯, the modern term for the sweet potato. Strange as it may seem, Kaibara Ikken was completely confused about these two types of potato. Hence he called the sweet potato *Ryukyu imo*, and the Irish potato he called by the term we now use for the sweet potato. Ono Ranzan 小野蘭山 (1729–1810), in his critical notes of Kaibara Ikken's work entitled *Yamato honzo hi-sei* 大和本草批正,[2] pointed out his error, stating that what he tried to differentiate was not the sweet and Irish potato, but rather the yellow and red varieties of the sweet potato. In fact the early herbalists confused the two, and Ono Ranzan himself, as it was later shown, was not infallible in this respect.

"In the meantime the Russians who came down to Matsumae 松前 or the present Hokkaido, known popularly in the 18th century as Ezo 蝦夷, introduced the potato during the Kansei period (1789–1800). Hence it was called *Ezo imo* (Iwasaki, bk. 2). From Hokkaido it migrated to the northern mainland. By the beginning

[1] Probably written before 1706, but published in 1714.

[2] Date not known. *Yamato honzo*, 1932, vol. 1, pp. 167–168.

of the 19th century, therefore, the potato was widely known and cultivated in Japan.

"In 1813 Otsuki Gentaku 大槻玄澤 (1756–1827), famous Dutch translator and physician, questioned Ono Ranzan's identification of *bareisho* as the Chinese nomenclature for the potato and asked the head of the Herbal Bureau of the Edo government, Kurimoto Tanshû 栗本丹州 (1756–1834). After careful consideration Kurimoto Tanshû replied that the *kô imo* 香芋 in the *Hua ching* 花鏡 probably corresponded to the Chinese term for the potato (Shirai, 1934 ed., p. 202). I mention this episode, because after this date the Chinese characters for the potato, definitely decided upon, were the following three: 馬鈴薯.

"The first extended treatise on the potato appeared in 1836, *Ni butsu kô* 二物考 by Takano Chôei 高野長英 (1804–1850), famous economist and social reformer. He writes that in some Japanese localities, the potato is called 'apfel' and 'erd apfel.' He was very enthusiastic about the cultivation of the potato. 'From a single plant one hundred to one hundred and fifty potatoes can be gathered in Holland, but in this country the average is forty to fifty, the maximum being sixty to seventy.' He writes as if by its extensive cultivation all the social ills of the empire could be cured in no time."]

Koreans have long known the potato, and in a few mountain sections it forms the staple article of diet. They are of good quality, and are largely eaten by foreign residents in the peninsula (Hulbert, p. 17).

Mrs. Bishop states (vol. 2, p. 8) that the potato is largely cultivated, and is now with the Koreans an article of ordinary diet. Excellent potatoes are grown on the mountain slopes at an altitude exceeding 3,000 feet (*ibid.*, p. 141). J. Ross (p. 303) says, however, that the people of Korea have no potatoes or carrots, while A. G. Lubentsov asserts that the potato is seldom encountered and little propagated in Korea. On the other hand P. Klautke, a recent author, reports (p. 49) that potato fields are encountered in Korea near every village and in the vicinity of every farm.

THE POTATO IN CENTRAL ASIA AND SIBERIA

In some measure, the introduction of the potato into the Himalayan region and farther northward may be connected with the administration of Warren Hastings, Governor of British India. When he sent George Bogle on the memorable mission to Bhūtān and Tibet in 1774, he instructed his emissary to plant some potatoes at every halting place, in order that a valuable new product might be introduced into Bhūtān. Indeed, there is a passage in Bogle's diary to the effect, "I planted ten potatoes" (somewhere in Bhūtān) (Markham, 1876, p. 19). R. Saunders, the surgeon attached to Turner's embassy in 1783, reports, however: "Mr. Bogle left potatoes, cabbage, and lettuce plants, all of which we found neglected and dispersed." (Turner, p. 395.)

According to L. A. Waddell (p. 351) the chief dish of the Tibetans is a stew of meat and potatoes, turnips, cabbage, and other vegetables, with, as a relish, some dried cheese (*Chura*), and on festive occasions a nibble at brown sugar, which is never used for tea. The same author holds (p. 422) that the excellent potatoes which are grown in most of the gardens near the capital, Lhasa, are probably the product of those which Warren Hastings with benevolent foresight instructed the Bogle Mission of 1774 to plant at every camp where it halted. While there is no reason to doubt that Bogle's activity may have given an incentive to the planting of potatoes in some parts of Tibet, it is, on the other hand, a bit of exaggeration to trace the entire cultivation carried on through such an immense country to the initiative of a single individual and to underrate the extent of Chinese influence on Tibetan agriculture. From Kansu, Szechwan, and Yünnan, Chinese officials, soldiers, and traders have constantly advanced into Tibet during the last centuries. There are, further, many Tibetan tribes settled on the actual territory of these three Chinese provinces, and all of these cultivate potatoes. The potato is listed in the *Dictionary of four languages* *[*Ssŭ t'i ch'ing wên chien* 四體清文鑑?], published by order of the emperor *[during the reign period] Ch'ien Lung (1736–95), its Tibetan name being given in the form *p'an-šu*, a transcription of Chinese *fan shu*.[1] Chinese books on Tibet, written toward the end of the eighteenth century, mention the potato among the crops of eastern and central

[1] Tibetan lacks the spirant *f* and substitutes for it labial explosives. *[The use of the term *fan shu* is not, however, conclusive.]

Tibet (Rockhill, 1891, pp. 271, 275).[1] The Tibetan term *rgya-gro* has been explained as "the potato introduced from India" (Das, 1902, p. 249), but *rgya* may as well refer to China, as it simply means "country," India being *rgya-gar* ("the white country"), China being *rgya-nag* ("the black country"), while in combination these color attributes are omitted.

"Potatoes are well known throughout eastern and central Tibet; in the former they are called *droma* or *liseu*, and in the latter country *shu-ko*. Their use is confined to the poorer classes." (Rockhill, 1891, p. 275.)[2] According to G. Sandberg (p. 329) potatoes are of two sorts—*sho-ko*, white; and *to-ma* [=*gro-ma*], small, sweet, red ones—and are largely planted near Lhasa, though on the Chinese borders all potatoes are a commoner vegetable. Chandra Das reports (1887, p. 47) that at Tag-ts'an Pum-pa potatoes of the finest quality, some even weighing half a pound each, were brought to him; and on inquiry as to how it was that potatoes were so plentiful and good there, while those of inferior quality could seldom be had elsewhere, he received the reply that potatoes had been known there from time immemorial.

Potatoes are grown in Nepal during the spring (Lévi, vol. 1, p. 303). J. D. Hooker (vol. 1, p. 259) found in eastern Nepal a kind of red potatoes as large as walnuts.

Into Kashmir potatoes were first introduced by Baron Hügel, and some were sent by him to Ladākh, where G. T. Vigne (vol. 2, p. 460) saw them growing. Again, they were planted there by Dr. Falconer. H. Ramsay (p. 124) states that potatoes were introduced into Ladākh some twelve years ago (1878) by Mr. Johnson, who was then Wazeer of Ladākh, and that they do fairly well.

The Lepcha of Sikkim, at the time of the introduction of the potato into Darjeeling, which was ceded to the British in 1835, applied to it their native word, *buk*, which is a general designation for the whole genus *Dioscorea*, according to Mainwaring (p. 259). In distinction from yam they style the potato more specifically *p'i-lin-mo buk* ("Frank" or "English yam"). A small potato is styled by them also *a-t'et*, which literally means thick, of proper consistency; said of milk when sufficiently boiled, or of muddy water (*ibid.*, p. 155). J. D. Hooker observes (vol. 1, p. 158): "The potato thrives extremely well as a summer crop, at 7,000 feet, in Sikkim,

[1] *[Two footnotes to translation of *Wei ts'ang t'u chih* 衛藏圖志, but the sources of information are only hinted at by Rockhill, p. 20.]

[2] The word *shu-ko* is written *žu-kog* or *žu-gog*. See also F. Grenard (p. 252).

though I think the root (from the Dorjiling stock) cultivated as a winter crop in the plains, is superior both in size and flavour." J. C. White states in the *Gazetteer of Sikkim* (p. 76) that there are two kinds of potatoes cultivated in Sikkim. In other Himalayan regions potatoes were known at an earlier date. The great Himalayan explorer, Alexander Gerard, who traveled between 1817 and 1829 reports (p. 65): "The people have begun to cultivate the potato, which is very productive, but not near so common as it ought to be, considering that my brother Patrick, at different times, distributed more than two thousand pounds weight of this valuable vegetable, to be planted throughout Busehur."

Potatoes are grown in Mongolia, according to the *Meng ku chih* published by Yao Ming-hui (ch. 3, p. 41), who avails himself of the term *ma ling shu.* Rockhill (1894, p. 36) found potatoes in some places of southern Mongolia, and F. von Richthofen (vol. 2, pp. 123, 136) reports the potatoes of Kalgan and southern Mongolia better than those of Europe.

In Russian Turkestan the cultivation of the potato is restricted to the area occupied by the Russian colonists (Machatschek, p. 149). According to an official publication of the Russian Department of Agriculture, *Industries of Russia* (vol. 3, p. 460), the potato was quite unknown in Russian Turkestan and the Trans-Caspian Province before the Russians settled there. However, according to some authorities it has been grown in the few places by the Tartar residents of Tashkend. At the present time, it is to be found occasionally on the grounds of Russian settlers, but almost exclusively in kitchen gardens.

In Siberia, potatoes are cultivated everywhere, and were no doubt propagated by the Russians. Aside from the common kind there is a red variety which in several regions of eastern Siberia is designated by the name "Chinese," because it is regarded as being of Chinese origin; this, however, is doubted by some authors (Jarilow, p. 279). Several aboriginal tribes also have been accustomed to the planting of potatoes; thus, the Yakut in the district Olyokminsk, where they lead an almost sedentary life, obtained during the three years from 1888 to 1890, thirty thousand pud of potatoes (Sieroshevskiĭ, vol. 1, p. 294). In the district of Yenisei potatoes are grown as far north as Imbatsk (Castrén, p. 228). In more recent times potatoes are also grown in eastern Siberia from imported American seed (Hosie, p. 111).

At the time of the Russian colonization of Sakhalin, the Ainu, settled in the southern part of the island, began to grow potatoes after Russian example. The story goes that some Ainu who planted a tuber received from a Russian settler went to the orchard the following day to find out whether a fresh tuber had grown; they uprooted the plant and ate the tuber (Sakhalinskiĭ Kalendar, p. 74).

THE POTATO IN PERSIA, THE NEAR EAST, AND THE CAUCASUS

Sir John Malcolm (1769–1833) introduced the potato into Persia, and he himself states (vol. 2, p. 514): "I took great pains to introduce the potatoe into Persia; and the soil, in many parts, proved very favorable to that vegetable." It is therefore known as "Malcolm's plum" (*ālū-yi Mālkam*). Malcolm was "minister plenipotentiary to the Court of Persia from the supreme government of India," in 1800 and again in 1808 and 1810. The potato is also called in Persian *sīb-i zamīnī*, *sīb-i zīr-i zamīn* ("earth apple").

The potato is almost unknown to the Arabs, who style it *kalkas firenji* ("Colocasia of the Franks or foreigners"). In Syria they were cultivated *[1844] only in Svedie near Seleucia, where they had been introduced by a British consul, Mr. Barker (Berggren, col. 641).

Formerly potatoes were imported into Constantinople from Malta or Odessa until the Turkish Government, in 1872, stimulated potato culture in the Akova ("White Plain") near Adabazar, according to von der Goltz (p. 387). From 1869 potatoes were cultivated in the plain of Erzerum. Cherkessians are said to have introduced them into Anatolia in recent times; Germans, into Angora. On the whole, declares K. Kannenberg (p. 141), potatoes are but little cultivated in Asia Minor, on a large scale only near Adabazar and Sabándja.

A colony of Suabians who emigrated from Württemberg about 1818 and finally settled in the Trans-Caucasian provinces, appears to have introduced the potato into the Caucasus. Baron von Haxthausen (pp. 54–55), who visited the German colony at Tiflis in 1844, found it in a very flourishing state and observed that the supply of the products of the field and garden—vegetables, fruit, and poultry—was in German hands. "The Georgians are an idle race," he says, "fond as they are, for example, of potatoes, they buy, beg, or steal them from the German colonists, but it has never occurred to them to cultivate these vegetables themselves."

The cultivation of potatoes is fairly extended in the Kuban Province and generally in the northern Caucasus, but in the Trans-Caucasus they are little grown, chiefly in the kitchen gardens of Russian colonists. Within a recent period, however, the cultivation of potatoes has been considerably extended in many places, and now forms a field crop (Russia: Department of Agriculture, *Industries of Russia*, vol. 3, p. 430). G. Merzbacher (vol. 1, p. 318) asserts that the potato is seldom cultivated in the Caucasus.

THE POTATO IN AFRICA

Nowhere in tropical regions has the potato obtained any economic importance, and in Africa it is grown but to a limited extent. It naturally has followed the white man into his colonies, and is successfully cultivated in Portuguese Angola, particularly in the highlands of Ambaca and in the territory of Mossamedes and Huilla (De Ficalho, p. 232). According to Proyart, who wrote in 1776, potatoes more savory than our own were planted by the Negroes of Lower Guinea under the names *bala* and *putu* (in Ehrmann, vol. 13, p. 170).

In the same manner as the Malayans designate the potato as the Dutch, European, or Bengal yam, the Negroes conceive it as "the white man's yam"; thus, in Mpongwe (Congo group) it is termed *mongotanga* ("white man's yam"), in Swahili *viazi ya kisungu* ("European root"). Around the Christian missions small potato plantations have grown up, and in some localities the Negroes have adopted the cultivation for the purpose of selling potatoes to Europeans. They thrive only in the higher mountains (Stuhlmann, p. 264). In the mountains of Réunion, it is said, potatoes grow almost wild and are thence exported to Mauritius (Oliver, 1890, vol. 2, p. 207).

Potatoes are now among the principal food crops grown by the settlers of the Kenya Colony in British East Africa, and are becoming very popular with the natives. They grow vigorously in the highlands, especially around Limoru; and on virgin land (cleared forest) a yield of nine tons an acre can be obtained (*Handbook of Kenya Colony . . .*, p. 413).

In Abyssinia and the Galla countries the potato appears recently to have become naturalized. In Egypt it thrives well even in the southern part, but is cultivated on a large scale solely for the benefit of Europeans. In Algeria, according to Schweinfurth (p. 517), potatoes are cultivated as a winter crop for purposes of exportation.

THE POTATO IN INDIA, BURMA, SIAM, AND INDO-CHINA

According to S. R. Dalgado (p. 24) the potato was introduced into India by the English in times posterior to the introduction of the sweet potato, as the potato is still termed by the Portuguese of India *batata de Surrate* or *ingleza*. It is cultivated by the Portuguese of Goa, but does not thrive there well (D. G. Dalgado, p. 133).

In 1822, H. Phillips wrote (vol. 2, p. 94): "Potatoes were scarcely known in the East Indies thirty years ago; but they are now produced to such abundance that the natives in some places make considerable use of them. Bombay is supplied chiefly with this excellent root from Guzerat.

"Potatoes were first introduced into India from the Cape of Good Hope, and have, for many years past, been cultivated with great success in the Bengal provinces; and, lately, of an excellent quality, in several situations in the Mysore country; particularly at *Bangalore* and *Nundydroog*. They are not so large as the potatoes of Europe and America; but not inferior in mealiness and taste to any in the world: the round kind is chiefly cultivated. For many years the Hindoos would not eat potatoes, but, latterly, they appear to have got over all their prejudices in this respect, and like them as much as they do the white yam, which they resemble greatly in taste." Thus wrote W. Ainslie (vol. 1, p. 329) in 1826.

Watt (1893, p. 266) gives his opinion as follows:

"The date of the introduction of the potato into India seems unknown, and very few facts can be gathered to give grounds for even an approximate date. It must, at any rate, have been widely cultivated in India before the beginning of the eighteenth century, since Roxburgh, who wrote at the end of that period, says that it was in his time cultivated largely during the cold weather and produced abundant tubers, and that this cultivation must have been going on for some considerable time. . . . The probability is that the cultivation of the potato was introduced into India from Spain, whether directly or indirectly it is impossible to say, some time between the end of the sixteenth and the beginning of the eighteenth centuries." An introduction from Spain is rather improbable; the end of the sixteenth century is too early a date. It is quite certain that in the eighteenth century potatoes were known in India, as Warren Hastings was much interested in their propagation (see p. 84). *[In this connection Dr. L. C. Goodrich supplies the following note: "A basket of potatoes, weighing about a dozen

pounds, was occasionally sent, as opportunity offered, by Warren Hastings [1772–1785 in India] to the Governor of Bombay, and was considered an acceptable present. On reception, the members of the council were invited to dine with the Governor to partake of the rare vegetable." (G. W. Johnson, p. 19, in William Stuart, p. 381.)]

Subsequently Watt stated (1908, p. 1028) that the first mention of the potato in connection with India appears in Terry's account of the banquet at Ajmir given by Asaph Chan to Sir Thomas Roe in 1615; but this is plainly the batata. John Fryer, whose travels in the East extended from 1672 to 1681, mentions potatoes twice (vol. 1, p. 263; vol. 2, p. 76): first, among the vegetables grown in the gardens of Surat (his addition of yams shows that he does not confound them with another species); second, as "the usual banquet" of the people of Karnatak (Canatick). Watt concludes: "It would thus appear that within a remarkably short interval after the discovery of the potato in America, it had been conveyed to India and was apparently at once taken up by the better-class Muhammadans as a desirable addition to the ordinary articles of diet." At first potatoes were eaten by the Mohammedans and Europeans only, but for some years past they have come into universal use. As an article of food, potatoes are now valued by all classes, especially among the Hindus on days of fast when they are forbidden the use of grain, but are said by them to have a tendency to cause indigestion. As a curiosity it may be mentioned that, according to W. Crooke (p. 103), it was a gang of Chinese convicts who started the thriving cultivation of potatoes and other vegetables at the hill-station of Mahabaleshwar.

In southern India potato culture is restricted mainly to the Nilgiri Mountains in the Madras Presidency. In the northern part of the country it is found both in the plains and in the adjoining mountains. As a rule, the cultivation is limited to the environment of large cities to supply the demands of the British, but it is gradually spreading to smaller places also. In the plain of Hindostan it is planted from the middle of September till the middle of November, and is harvested from the middle of January to the middle of March. In the United Provinces the cultivation was started by the gardeners around Farukhabad, who subsequently brought it to the vicinity of Cawnpore. In the district of Farukhabad the cultivation is intensive; three harvests are obtained annually, with the rotation: maize, potatoes, tobacco. The potato is usually grown after Aus paddy, jute, or maize, but it often forms the only crop of the year. In the

district of Baghelkand, in parts of Bihar, and in the Khasi hills, two crops of potatoes are taken from the same land in one year. Conditions are more favorable in the mountains than in the Ganges Valley, and the mountain products are generally superior to those of the plains. In the United Provinces the mountainous country of Naini Tal is the most important source of supply. There the cultivation has become more general since about 1840. In the plain of Gujarat the tubers are planted in October and lifted in March, but in consequence of the heat remain comparatively small. It is difficult to preserve the tubers during the rainy season; in the district of Surat, therefore, tubers imported from Italy are frequently used and thrive particularly well.

The northern district of Poona is most important for potato culture; in 1888–89 seven thousand acres in the taluka Khed were occupied by potatoes. There are two harvests annually: the tubers planted in July grow during the rainy season, and are lifted in September; again, with the aid of artificial irrigation, they plant in December (in higher altitudes in October) and harvest in February or March, respectively. This cultivation is very remunerative, as the produce finds its way to the Poona and Bombay markets.

Statistics of potato cultivation exist only for the Presidency of Bombay from former years: in 1888–89 there were 11,700 acres given over to potatoes (Englebrecht, pp. 47–48; Mukerji, pp. 289–294).

The following example of high-mountain cultivation may be of interest to students of native American agriculture in comparison with that of the Indians: "The steep ascent on the northern shoulder of Mahasu, from 8,000 feet, and even lower, to above 9,000 feet, is the great seat of the potato cultivation in the neighbourhood of Simla. The steepest slopes seem to be preferred for this purpose, if they have only a sufficiency of soil, which is very light, loose, and stony. The undergrowth of shrubs is cleared away entirely on the spot where potatoes are planted, but the pine forest is only partially thinned, the tall straight trunks allowing free circulation of air below, while the thick branches above afford the amount of shade requisite for the crop. The potatoes are planted in rows in May; and, early in June, when the plants have attained a height of a few inches, the soil is earthed up round their stems in low ridges. The rains commence in the latter part of June, and during their continuance nothing is done to the crop, beyond keeping it clear of weeds. The steepness of the slope seems to afford a sufficient drainage to prevent any injury from the great rainfall and constant

humidity. The growth of the plants is exceedingly luxuriant, the foliage being tall and bushy. By the middle of October, or after the close of the rains, the potatoes are dug and ready for market, supplying not only the station of Simla, but being despatched in great quantities to the plains of India, where the potato is only cultivated as a winter crop, and where, therefore, during the cold months, none are otherwise procurable." (T. Thomson, p. 34.)

According to J. D. Hooker (vol. 2, p. 277) potatoes were introduced among the Khasi in Assam about twenty years ago (that is, about 1830) by a Mr. Inglis, and they have increased so rapidly that the Calcutta market is now supplied by their produce. E. A. Gait (p. 346) states that potatoes were introduced in the Khasi hills by David Scott. It is quite possible and natural that several introductions have taken place through different individuals and into different spots of this territory. Major P. R. T. Gurdon (pp. 42–43) thus describes the process of cultivation among the Khasi: "Potatoes are raised on all classes of land, except *hali*, or wet paddy land. When the land has been properly levelled and hoed, drains are dug about the field. A cultivator (generally a female), with a basket of seed potatoes on her back and with a small hoe in her right hand, digs holes and with the left hand drops two seed potatoes into each hole. The holes are about 6 in. in diameter, 6 in. deep, and from 6 to 9 in. apart from one another. Another woman, with a load of manure in a basket on her back, throws a little manure over the seed in the hole, and then covers both up with earth. After the plants have attained the height of about 6 in., they are earthed up. When the leaves turn yellow, it is a sign that the potatoes are ripe."

In regard to Burma, F. Mason (p. 133) stated, in 1851: "The potato is of easy culture but the tubers are very small, and it is not an object of cultivation, though with a little attention, it might possibly be made one." He gives no Burmese name. Potatoes are grown by the Kakhyen of Upper Burma in the hills; they are described by G. W. Strettell (p. 120) as small, but capital eating.

In British Burma potato cultivation has been considered since 1882. Seed potatoes were procured from England and Scotland, but the trial did not give good results at first. In 1883 an out-turn of nineteenfold in the Karen hills was the highest. The people of several villages in the Karen hills planted the tubers with more or less success (Watt, 1893, p. 272).

In regard to Siam, Pallegoix (vol. 1, p. 126) remarks: "The mountains and forests harbor several sorts of *pommes de terre* which

are of great utility in times of famine. There is, in particular, one, called *kloi*, very remarkable for its extreme whiteness; but it is poisonous, and before eating, it must be sliced, soaked in water, and then dried in the sun." The term *pommes de terre* is evidently employed in a loose manner, and seems to relate to indigenous species of tuberous plants, probably *Dioscorea*. Prince Dilock of Siam observes (p. 167) that quite recently attempts have been made to cultivate potatoes, but, though they thrived well, these experiments were soon abandoned, because the natives did not esteem potatoes. Small quantities were imported, but for the exclusive use of Europeans resident in Siam. Accordingly the Siamese show the same attitude toward the potato as the Chinese.

In Tonking, potatoes (*pommes de terre*) were mentioned by De La Bissachère in 1807 (Maybon, p. 154). Ch. Crevost and Ch. Lemarié write (vol. 1, p. 185) that the potato does not thrive well in the climate of Indo-China and that the French colony is obliged to import from abroad almost the entire quantity consumed by Europeans. Yet it has been proved that in suitable soil its cultivation is possible in Tonking during the winter. It is encountered more and more in the French orchards and even with Annamese or Chinese gardeners, who specialize in the small, new potato. In certain spots, notably in the sandy soils near the ocean, field cultivation begins to extend. The products of Doson enjoy a well-deserved reputation. At the suggestion of the agents of the Direction des Services Agricoles et Commerciaux, the cultivation is successfully practiced in the interstices of the mulberry plantations. From a practical handbook for the gardeners of Indo-China it appears that the potato is planted there in October or November and that its cultivation is now quite popular (Lan, p. 49).

The potato was introduced a few years ago among the Miao of Tranninh in Tonking by Barthélémy, and thanks to his efforts the French of Xiêng-khwang and vicinity are now supplied with potatoes, but it seems that they are not yet introduced into other territories of Tonking inhabited by Miao (Savina, p. 215).

THE POTATO IN MALAYAN AND OCEANIC REGIONS[1]

As regards the Philippines, the potato appears first to be mentioned by the famous Jesuit naturalist, George Joseph Camel (Camell, Camelli, Kamel), who resided there toward the end of the seventeenth century. He describes it under the Peruvian name *papa*, as follows (p. 39, No. 22): "Papas, folia habet septem aut novem, uno in pediculo, radicem et atro-rubentem, interne candidam, aut flavescentem, gummosam, et friabilem, ex qua farinam potui *Chunno* parando conficiunt, haec ex *Chabraeo* [Chabrée]. Papas, C. Bauhinus *Solani tuberosi* titulo eleganter describit, et depingit. An idem ac *Hettig?*" This query refers to his No. 20, where we read, "Hettig, Aestum Plinii, foliis est malvaceis, radice candida, et flava." The word *pápas* is still used on the Islands for the potato, as is also *patátas* (Merrill, 1903, pp. 94, 185).

The potato is now cultivated generally, especially in the mountainous regions of the Archipelago, according to Merrill (1904, p. 35), but the tubers are usually very small and of an inferior quality. They are grown in Cebu Island (in the west-central part of the Archipelago), says Foreman (p. 356), but are rarely any larger than walnuts. He adds that with very special care a larger size has been raised in Negros Island (in the same vicinity), and that potatoes of excellent flavor and of a pinkish color are cultivated in the district of Benguet.

In the Straits Settlements the potato is commonly called *ūbi Benggala*, since most of those used in the Straits come from Bengal (Swettenham, vol. 1, p. 93; vol. 2, p. 158).

For the Dutch East Indies there are several notes of interest. The *Encyclopaedie van Nederlandsch-Indië* (vol. 1, p. 1) states that the Hollanders probably brought the potato to the Dutch Indies, but that possibly the Chinese introduced it. From what has been said above about the Chinese attitude toward it, this supposition does not appear very probable. The Batak inhabiting the high Karo plateau of Sumatra are said to raise very good potatoes, using a more rational method than the Javanese (*ibid.*). Regarding the latter country, Crawfurd (vol. 1, pp. 375–376) described in 1820 the introduction and method of cultivation of potatoes as follows: "The Dutch of very late years have introduced the American potatoe (*Solanum tuberosum*) into Java. Such is the supineness of the European colonists, and their imperfect occupation of these coun-

[1] *[This chapter had not been completed by Dr. Laufer before his death. The notes have been organized in their present form by C.M.W.]

tries, that the event cannot be dated farther back than thirty years. In Malay, the potatoe is called *Ubi Europa*, or the European yam, and in Javanese *Kăntang Holanda*, or the Dutch *Kăntang*, names which sufficiently describe its origin. The potatoe reared in Java is of good size and excellent quality, being, I think, more delicately flavoured than those raised in Europe, and much superior to those cultivated in any part of Hindustan. They grow abundantly without dressings, and almost indiscriminately at every season of the year, so that the care of storing them is unnecessary, and the fresh root is ready for the table at every season. During the British possession of the island, the culture was greatly extended from the increased demand for them, and within the last few years the natives of the mountains and of the valleys near them have begun to use them as an article of diet. But as the production of this root is confined to the high lands, and the quantity of food yielded by them from a given quantity of land and labour is much smaller than afforded by other tuberous roots, as the yam, the *arum*, and, above all, the sweet potatoe or *Batates*, it is evident they can never become in these climates, an article of general consumption."

A. R. Wallace, who visited the Portuguese portion of Timor in 1861, says (p. 146) that "potatoes are grown higher up in the mountains in abundance, and are very good."

In the mountainous parts of the Celebes potatoes thrive well, according to Graafland (vol. 2, p. lxi). There is a tale current in the Moluccas that the first potatoes planted in Buru, the western of the two main islands, came from a brig which had been cast adrift on its south shore. The Alfur of Buru call the potato *mangabreke*, with reference to this story, the name meaning literally "eating from the brig." (Wilken, vol. 1, p. 93; Martin, p. 357.) The potatoes of Buru are small but of rather good taste.

While the other inhabitants of the mountains of New Guinea as a rule subsist on the sweet potato (*Ipomoea batatas*), the Papuans living in the Arfak Mountains in West New Guinea plant potatoes on a large scale and use them as their chief article of food (*Encyclopaedie van Nederlandsch-Indië*, vol. 1, p. 1). The Germans are said by Zöller (p. 191) to have introduced potatoes into the former German territory of Kaiser-Wilhelm-Land.

In the Fiji group, on the east coast of Viti Levu, B. Seemann (p. 306) reported in 1862 that he found potatoes grown at Mataisuva. He describes them as "tolerably good."

Information regarding the introduction of the potato into New Zealand is relatively complete due to the excellent studies of Elsdon Best (pp. 148–153) and G. M. Thomson (pp. 448–451); and these data should throw a valuable light upon the probable history of potato cultivation in other incompletely reported Oceanic regions. The following is an abstract of the information found in these two works. To the Maoris the potato was the most welcome of all introduced foods and was even more useful than the pig. After its adoption by a few coastal tribes it spread rapidly into the interior, where it was particularly valuable in mountainous and cold regions, and where it at once considerably improved the native diet. Forests, which had formerly been strictly conserved as an important source of food supply, became of secondary value. Small areas were destroyed year by year in making potato gardens.

Many early explorers started potato patches at the points where they touched, and duly noted this enterprise in their journals. It is said that the first potatoes were left by De Surville in 1769, though no specific mention appears in the journals of L'Horne or Monneron. Three years later Marion planted potatoes in the far north and took pains to explain to the natives the value of this and other plants. S. J. Roux, lieutenant on Marion du Fresne's vessel *Le Mascarin*, wrote in the journal of that expedition: "As the natives are extremely intelligent, we were able to make them understand that the plantations we had made on Marion Island of wheat, maize, potatoes, and various kinds of nuts, might be very useful to them. All these plants had grown very well, although it was winter." (Best, p. 149.) In the account of Cook's first voyage to New Zealand nothing is said concerning the potato, but in Forster's description of the second voyage there is the following description of the planting done at Queen Charlotte Sound (on the northeast end of South Island) in 1773: "Captain Cook, who was determined to omit nothing which might tend to the preservation of European garden plants in this country, prepared the soil, sowed seeds, and transplanted the young plants in four or five different parts of this Sound. . . . He chiefly endeavoured to raise such vegetables as have useful and nutritive roots, and among them particularly potatoes, of which he had been able to preserve but few in a state of vegetation. He had likewise sown corn of several sorts, beans, kidney beans, and peas, and devoted the later part of his stay in great measure to these occupations." (*Ibid.*)

It cannot be affirmed positively that the potatoes planted by Cook were preserved and propagated by the natives. Forster tells us, however, that Cook took special pains to impress the southern natives with the value of seeds planted: "Captain Cook, apprehensive lest the natives should find our garden and destroy it, not knowing for what purpose it was intended, conducted Teiratu thither, and showed him every plant in it, especially the potatoes. He expressed a great liking to the last, and seemed to know them very well, evidently because a similar root, the Virginia or sweet potato, is planted in some parts of the Northern Island, from whence he came. The captain parted from him after obtaining the promise that he would not destroy his plantations, but leave everything to grow up and propagate." (Best, pp. 149–150.) In 1777 Cook again reached Queen Charlotte Sound on his third voyage, and described the condition of the gardens he had so carefully planted four years earlier. They had all been destroyed to make room for buildings, but he notes that ". . . at all the other gardens then planted by Captain Furneaux, although now wholly over-run with the weeds of the country, we found cabbages, onions, leeks, purslain, radishes, mustard, etc., and a few potatoes. These potatoes, which were first brought from the Cape of Good Hope, had been greatly improved by change of soil; and, with proper cultivation, would be superior to those produced in most other countries. Though the New Zealanders are fond of this root, it was evident that they had not taken the trouble to plant a single one (much less any other of the articles which we had introduced); and if it were not for the difficulty of clearing ground where potatoes had once been planted, there would not have been any now remaining." (*Ibid.*)

By 1805, in any event, the potato had become well established at the Bay of Islands, far north in North Island, in the region where Marion had attempted to introduce them. Dr. Savage visited there and gives the following interesting report: "The inhabitants of this part of the world are by no means unskilled in arts and manufactures: among the former is their cultivation of the ground. This, it is true, is confined to the growth of one vegetable, but in which they are remarkably successful: I allude to potatoes; and, indeed, I never met with that root of a better quality; they keep remarkably well, and we provided a stock of them sufficient to supply the whole ship's company for several months. . . ." (*Ibid.*) It appears from the rest of his account that the natives, although they were very fond of potatoes, ate them only sparingly, so as to have a good stock always

on hand to supply European ships in exchange for iron. Savage states further that the reason all other plants were neglected was that they were not good for trade. A few years later, in 1814, Reverend Samuel Marsden landed also at the Bay of Islands, and wrote the following graphic description of native potato cultivation, which substantiates the remarks of Dr. Savage: "Their potato plantations are all very neatly fenced in, and were in as high a condition as the gardens in and near London, as they do not suffer a single weed to remain that would injure the growing crops. The flat where the natives were encamped might contain somewhat about a hundred acres or more, part of which was enclosed and planted with potatoes. We were furnished with a good supply of potatoes and pork." (G. M. Thomson, p. 450.)

The experience of Commander Bellingshausen, when visiting New Zealand in 1820, was opposite to that of most explorers and traders, for he reports that the natives grew potatoes only for their own use and would not part with them (*ibid.*). That his experience did not reflect any real change in Maori economics at this time is clearly shown by the records of various whaling stations, which indicate a lively trade in potatoes carried in western ships between New Zealand and Australia. Entries between 1813 and 1820 such as "eight tons from Otago," and "four tons from Preservation Inlet" (southeast and southwest coasts of South Island, respectively) clearly record this trade, as do remarks of later travelers (*ibid.*).

The account of the voyage of the *Venus* (1836–39) also gives interesting information concerning the early use of the potato in the Bay of Islands region, and method of cultivation. "On coming away from the *pa* of Kawakawa, we noticed some natives who were planting *pommes de terre*. For this purpose they made use of a small piece of straight iron, something like an elongated nail, with which they scooped a hole for every one. They then returned the earth on top so that each tuber was surmounted by a little cone something like those made by the moles in their earth-works. This arrangement, observed with great exactitude, gave to the plantations an appearance of very finished culture." (Best, p. 151.) There follows the statement that the natives prepared the lands which they planned to cultivate—usually that covered with bracken was selected—by burning off all the vegetation. They seldom sowed the same ground two years in succession, but allowed it to lie fallow a year or two before returning to it. As soon as a piece of land was

sown it became *tapu*, and no one dared to infringe upon it. The whole tribe united to do the work of harvesting.

The potato had become so firmly established by 1839 that Bidwell, traveling between Tauranga, on the east coast of North Island, and Tongariro, a mountain almost in the center, could report that ". . . the potato might be taken for an indigenous plant, as it is impossible to go anywhere without finding it growing wild. Maoris only grow potatoes in land which is just cleared, and after about three crops abandon it, and clear another portion of forest." (G. M. Thomson, p. 451.)

A strong tradition exists among the Maoris that they cultivated certain varieties of the potato before the advent of Europeans. Of this Best is properly skeptical. He explains (p. 152) the tradition on the grounds that the coastal tribes passed the tuber and its method of cultivation into the interior, where it was adopted by other groups which had no idea of its source nor any knowledge of the white trader. He calculates, for example, that if the potatoes planted in Queen Charlotte Sound by Cook in 1773 were perpetuated, then the tribes of Cook's Straits must have been cultivating the potato nearly fifty years before the coming of traders and whalers to the latter region. This case is instructive, for similar situations occur frequently everywhere; introduced plants, after a long period of cultivation, are easily looked upon as native or even cultivated from time immemorial (compare, for instance, the tradition on Java concerning tobacco's being indigenous), so that such oral tradition can lay little or no claim to historicity.

The Maoris soon recognized the great superiority of the potato over the *kumera*, which requires much more care in its cultivation. The aborigines soon became skilful in potato culture and conceived some methods of their own unknown to the European settlers. For instance, in order to obtain a very early crop, seed tubers were planted in June in scrub land or light bush, and subsequently the bush was felled and burned in early spring. The fire destroyed the halm of the plants that had grown up through the felled timbers, but a new growth soon followed, whereas exposure to frosts would have spoiled the crop.

The potato proved in particular a boon to the natives living in the southern half of South Island, which was too cold for the semi-tropical products brought along by the Maoris after their immigration into the islands. That the aptitude for agriculture still survived centuries of disuse is proved by the avidity with which the southern

Maoris acquired and grew potatoes. Williams, who visited the Bluff of South Island in 1813, narrates: "The natives attend to cultivation of the potato with as much diligence and care as I have ever seen. A field of considerably more than 100 acres presented one well cultivated bed, filled with rising crops of various ages, some of which were ready for digging, while others had been but newly planted. Dried fish and potatoes form their chief support." (Best, p. 152.) This is the first description of potato culture in southern New Zealand.

APPENDIX I. NOMENCLATURE OF THE POTATO

Solanum tuberosum (Solanaceae). This name appears first in Caspar Bauhin's (1560–1624) *Phytopinax* (Basle, 1596, p. 302), and was subsequently adopted by Linnaeus (hence *Solanum tuberosum* L.).

Peruvian: *papa* (Cieza de Leon).

Quechua: *ascu, acsu.* Chinchay dialect: *axšu.*

Aymará: *choke, amka* ("testicle").

Chibcha: *yomsa, yomuy.*

Araucano (Chile): *poñi* (*ponyi, pogny*), cultivated; *malla* (*maglia,* Italian spelling of Molina), a wild species.

Tupi (Brazil): *cara-ti* ("white yam").

Spanish: *turma de tierra* ("truffle," literally "earth testicle"), in the early chroniclers of South America; *papa* (from Peruvian) in Spanish America, also in Andalusia and Estremadura in Spain (but otherwise unknown in Spain); *patata* (properly the sweet potato), in Spain.

Catalanian: *criadeta, trumfa* ("truffle").

Portuguese: *batatéira,* the plant; *batata, batatinha, batata ordinaria, batata de terra,* the tuber. In Brazil and San Nicolau Island (Cap Verde): *batata ingleza.* Madeira: *semilha.* Goa: *batata de Surrate* (that is, batata introduced through the factory of Surrate). Malayo-Portuguese of Batavia: *koemblie* (from Malay *kembili*) *hollanda, poma de terra.*

Italian: *patata, batata* (from the Spanish); *tartuffo, tartuffolo* ("truffle"), modeled after Spanish *turma de tierra.* Venezia: *tartufola.* Milano: *tartuffol.* Piedmont: *tartiflo.* Sicily: *tirituffulu* and *catatuffulu.* In dialects: *pomo di terra.*

French: *cartoufle,* first in Olivier de Serres, *Theatre d'agriculture et mesnage des champs,* 1600 *[1802, vol. 3, p. 173]: "C'est arbuste, dict *Cartoufle,* porte fruict de mesme nom, semblable à truffes, et par d'aucuns ainsi appellé." Southern French: *kartufle* (Meyer-Lübke, p. 681). Namur: *kartuš; papas des Indes, papas des Espagnols* (Caspar Bauhin, *Prodromos theatri botanici,* 1620 *[ed. of 1671, *Prodromos:* p. 90, gives *Papas Indorum vel Hispanorum*]; *artichaut des Indes,* name formerly used in Burgundy; *truffe, truffe rouge* (1689), *patate* (1723), *topinambour* or *taupinambour* (properly *Helianthus tuberosus*), were occasionally used, while *patate* is still the name of the potato in Brittany; *morelle tubéreuse, solanum tubéreaux,* scientific term; *pomette, poire de terre, poirette* ("little apple,

earth pear, little pear"); *parmentière*, or *solanée parmentière*, named for Parmentier; *pomme de terre* (with the erroneous addition: *ou topinambour*), first employed by Frézier (*Relation du voyage de la Mer du Sud aux côtes du Chily et du Perou*, 1716) and in Duhamel du Monceau (*Traité de la culture des terres*, 1754–57), while French *patate* is now correctly used for the sweet potato. The term *pomme de terre* was originally applied to the topinambour (*Helianthus tuberosus*) (*Dictionnaire des sciences naturelles*, vol. 42, 1826, p. 446). Names for varieties are *poméranienne* (oblong sort), *vitelotte* or *viquelotte* (red sort), *patraque* (round sort).

English: *potato of America* or *Virginia* (John Gerard, *The herball; or, General historie of plantes*, 1597); *apple of youth* (John Parkinson, *Paradisi in sole paradisus terrestris*, 1629); *potato*, early modern English also *potatoe, pottatoe, potatus, potades;* also *botatas*. Down to the middle of the seventeenth century, this word in general relates to the sweet potato. W. Hughes (*The American physitian*, 1672, p. 14) says, "The *Indians*, as also some of the *Blacks* and *Spaniards*, do call them *Papus;* but we *English* call them *Potatoes*."

United States: *white potato, Irish potato, murphy*.

Swedish: *potatis*.

Danish: *potet, potetes*.

Dutch: *aardappel* ("earth apple").

German: *kartoffel* (eighteenth century), derived from Italian *tartufo, tartufolo* ("truffle") through the medium of French *cartoufle* (1600). (The name *taratoufli*, in the handwriting of Clusius, first appears in 1589 on a colored illustration of the plant; it was still used in 1675 by P. Ammann (*Supellex botanica*, p. 124), who writes *taratuffli*. Castore Durante (*Herbario nuovo*, Venezia, 1584 *[ed. of Rome, 1585, p. 450]) informs us that truffles (*tubera*) were then styled in Italy *tartufi* and *turtufoli*.) *Erdapfel, erdbirne* (eighteenth century), originally applied to *Helianthus tuberosus*. According to Clusius (*Rariorum plantarum historia*, p. 264), *erdtapfel* was employed by the peasants near Vienna for *Cyclaminus;* also according to Mattioli (*Neu Kreuterbuch*, 1563, p. 224), who adds *Panis porcinus* or *Schweinbrodt* as synonyms. Formerly *artoffel, ertoffel*, from *erd-kartoffel*. German *grundbirne* is said to denote in Lausitz and Meissen the eatable, tuberous root of *Helianthus tuberosus*, and to have been transferred to the potato in the eighteenth century (Weigand, vol. 1, p. 737). In dialects it is *grommbīr*, Bavarian: *krumbeer;* Kärnten: *gruntpirn, grumper, krumpir*.

A dialectic form, *patake* or *potakke* (East-Frank), is based on Spanish *pataca*, which applies to *Helianthus tuberosus*. C. Bauhin (*Prodromos theatri botanici*, 1620 *[ed. of 1671, *Prodromos:* p. 90]) says that the Germans call the plant *grüblingbaum*, that is, truffle-tree; this name is also employed by Jacobus Theodorus (*Neu vollkommen Kräuter-buch*, Basle, 1687, p. 868).

Low German: *tüften, tuften, tüfken, tufken, irtüften, irrtüffeln, tüffeln, kantüffeln, pantüffeln, nudeln.*

Slavic: The Slavic peoples received the potato from Germany toward the end of the eighteenth century. There are three groups of words in use for it in the Slavic languages, all traceable to German:

(1) The group represented by German *kartoffel:* Russian: *kartofel'*, in popular speech *kartóška* (with diminutive termination); in dialects: *kartópl'a, kartóčl'a, kartóvka*, in the plural *kartyší, kartósy*. Polish: *kartofel;* in dialects: *kartofla, felka, tufle, tyfka, tywka, karczofle;* in the Polish of the eighteenth century occurs *tartofl*, corresponding to Italian *tartufolo*, the model of the German word. Slovenian: *krtola.*

(2) The group represented by German *grundbirne*, dialectically *grommbīr:* Bulgarian: *krompír* or *krumpír*, also *kompíri, gombíri;* plural *gombelki*. Serbian: *kròmpīr, krùmpīr*. Slovenian: *krompír*. Czech: *krumpír, krumple*. Moravian: *grumbír*. Slovak: *krumpla*. In Polish dialects: *kompery, kumpery, krompele*, and *kraple.*

(3) In Czech we find *brambor* as a word for the potato; in Bulgarian: *barabój, baraból;* in South-Russian: *mandybúrka, bandúra, baraból'a, garaból'a, gardybúrka.* This group is connected with the name Brandenburg (Old Czech: Bramburk; Upper Sorbian: Brambor, with the meaning "Prussian"), as probably referring to the locality from which the potato was introduced. In Polish an oblong potato of violet color is styled *berlinka* (Berneker, pp. 81, 491, 622). Russian also *bun'ba.*

Lithuanian: *klumberis* (from German *grundbirne*).

Hungarian: *krumpli* (from German *grundbirne*), *pityóka, puczóka, csucsorka, csicsóka;* *[*burgonya*, a literary term].

Rumanian: *crúmpira, crumpena, crumpen, grumciri* (from German *grundbirne*), *cartofla, cartofa, cartof, bandraburca* ("Brandenburg"), *baraboi, bara-bula* (in Moldavia), *mere-de-pamînt* (Transylvania), *nap* ("turnip"), *picisica, piciorca* (*Agaricus campestris*), *bologeana, pom-de-pamînt, nap turcesc, porcesc* ("topinambour"). Moldavia: *gulie* ("topinambour"), *picióaca* (from Hungarian *pityóka*).

Neo-Greek: *patata, geō'melon* ("earth-apple").

Hungarian Gypsy: *pçuvune, pityoká* (from Magyar *pityóka*). American Romani (Gypsy): *pūvéngero* (*pūv*, "earth, ground").

Osmanli: *patate, badate, yer almási* ("earth-apple").

Karaim of Troki: *bulba.*

Chuwassian: *ulma* ("apple").

Finnish: *maaomena* ("earth-apple").

Chinese: *yang shu* 洋薯 ("foreign Dioscorea"); *yang yü* 洋芋 ("foreign taro"); with the west-Szechwan variant 羊芋 (literally "sheep taro"); *Yang yü* 陽芋 and 楊芋 ("taro of Yang"); *shan yü* 山芋 and *yang shan yü* 洋山芋 ("mountain taro" or "the foreign mountain-taro"); *ma ling shu* 馬鈴薯 (literally "horse-bell yam" because the tubers are supposed to resemble a horse-bell); *Ho-lan shu* 荷蘭薯 ("Holland Dioscorea"). Colloquial names: *shan yao tan* 山藥蛋 ("mountain medicinal egg," cited in the *Chih wu ming shih t'u k'ao*); *shan yao* or *shan yo* or *shan yao tou'r* 山藥荳兒 (literally "mountain medicinal bean") in Peking; *t'u tou* 土豆 ("earth bean") in Tientsin;[1] *shü tsai* 薯仔 in Canton. *[Doubtful: *fan shu* 番薯, the regular name for the sweet potato but perhaps sometimes mistakenly used for *Solanum tuberosum; chan yü* 鵲芋 in the *Sui ching t'un chih*, but see p. 76, footnote 1.]

Miao: *yang yü* (a Chinese loan-word).

Dioi: *dak iang iü.*

Siamese: *man farang.*

Annamese: *khoai tày.*

Tibetan: *p'an šu* (transcription of Chinese *fan shu* *[but see p. 72, footnote 2 and p. 84, footnote 1]); *rgya gro* (pronounced *gya-d'o*), from *gro-ma* (*Potentilla anserina*) and *rgya*, which may refer to India or China; *skyiu* (Sikkim), originally referring to *Dioscorea; p'i-lin skyiu* ("English Dioscorea"); *žo-gog, žo-kog* (pronounced *žo-g'o, žo-ko*); *ia-lu* (from Persian-Hindustānī *ālū*), in West Tibet.

Lepcha: *p'i-lin-mo buk* ("English Dioscorea").

Dafla: *ked-blaiam* ("earth egg-plant").

*[Japanese: *bareisho* 馬鈴薯; *Jagatara imo* 咬噠吧薯, that is, Jactra or Batavia tuber; *Orando imo* 和蘭薯, Holland tuber; *Ryukyu imo* 琉球薯, tuber from the Ryukyu Islands (used by Kaibara

[1] The names *T'u-yü* 土芋 ("native taro") and *T'u-luan* 土卵 ("ground egg"), given for *Solanum tuberosum* by Stuart (p. 413) are not correct; they relate exclusively to a species of *Dioscorea.*

Ikken, but probably the sweet potato); *Ezo imo* 蝦夷薯, tuber of Ezo (Hokkaido).]

Ainu: *toma, appura* (from Dutch *aardappel*).

Korean: *kam-tsa.*

Mongol: *lankkirun.*

Kalmuk: *bodomontsok.*

Manchu: *larhôn.*

Malayan: *artapel* (from the Dutch *aardappel*); *ūbi welanda* ("Holland yam"); *ūbi Europa* ("European yam"); *kembīli welanda* ("Holland tuber"); *ūbi Benggala* ("yam from Bengal"), according to Swettenham (vol. 1, p. 93), "as most of those used in the Straits come from Bengal"; *kentang* ("tuber").

Java: *kantang, kentang; kentang welonda* or *holanda* ("Holland tuber"); *uwi kentang* ("yam tuber").

Bali: *sabrang jawa.*

Sumba: *ketawi jawa.* These two terms allude to Java.

Sunda: *huwi walanda* (applies also to Manihot), *kentang.*

Minahasa: *kapu ne walanda.*

Palembang: *ubi kumandur.*

Menangkabau: *ubi ulando, pelo gadueng.*

Sika (Flores): *tuka wawa, tuka wolonda.*

Philippines: *papas, patatas* (from the Spanish).

Fiji: *kawai ni vavalagi* ("tuber of foreigners").

Maori: *riwai, hiwai; kapana, taiawa* (literally, "a foreigner"); *parareka* (*para,* "an edible fern;" *reka,* "sweet"); *kokari* (new potatoes); *kotero* (potatoes steeped in water); *kotipo* (a purple potato); *kotokoto* (small potatoes); *kupango* (potatoes spoiled by the heat of the sun and greenish in appearance; *pango,* "black"); *ngihongiho* (small potatoes); *ngote* (a small potato). (After E. Tregear *[p. 653 and *passim*].)

Neo-Sanskrit: *golālu.*

Hindustānī: *ālū* (also in Parbatiyā, Nepal).

Bihār: *ālu,* in east Tirhut also *āru;* north of the Ganges *alua* and *aluī.* North of the Ganges *lalka* or *dackhini* denotes a red kind; and *maldahiya* or *napali,* a white one. A red variety of *maldahiya* is called *maldahiya kanakpuriya.* Seed potatoes brought from the hills are termed *bīya ke alu;* the "eye," *ānkhi* or *ānkh.* The produce of those kept for the following year is styled *pahila māñti*

ke bīya; and the seeds of this crop kept for the third year, *dosra māñti ke bīya* (Grierson, p. 250).

Singhalese: *rata innala,* or *artapal* (from the Dutch *aardappel*).

Tamil: *wallarai kilangu.*

Telugu: *uralai gudda.*

Concani: *baṭāṭo, boṭāṭe, baṭāṭín* (from the Portuguese *batatinha*).

Marathi and Gujarātī: *baṭāṭá.*

Persian: *ālū-yi Mālkam* ("Malcolm's plum," after Sir John Malcolm, who introduced the plant into Persia); *sīb-i zamīnī* ("earth-apple").

Arabic: *kalkas firenji* ("Colocasia of the Franks").

The European nomenclature demonstrates plainly that great efforts were made from the latter part of the sixteenth century to coin a suitable name for a product of foreign importation. These efforts are by no means deserving of praise, and we hardly have reason to be proud of the result. The only sensible people are the Spaniards of South America, who have adopted the Peruvian designation *papa.*[1] We can realize, however, that this word did not appeal to the Spaniards of Europe and the Italians (presumably owing to the homophony with *il Papa*). It is regrettable that *patata* (hence our potato), properly the designation of the sweet potato, was applied to the plant, as the two have no botanical relationship and the duplication of name has given rise to many unnecessary confusions. Both in England and Spain, the potato was preceded by the sweet potato; in Spain the potato was hardly known in the beginning of the eighteenth century, while the sweet potato was cultivated in the sixteenth century. The phonetic differentiation of *patata* and *batata* is curious. The word *pataca,* however, which Meyer-Lübke (p. 466) places with *patata,* is independent and denotes *Helianthus tuberosus.* In view of the fact that the subterranean tuber is the most prominent characteristic of the plant, descriptive names bearing on this single trait were formed. The comparison with truffles first came to the early Conquistadores of Peru, who thus spoke simply of "earth-truffles" (*turma de tierra*). With this name, the tubers were apparently handed on to Italy, where the word *tartufo* or *tartufulo* of the same

[1] R. Lenz (p. 558) says justly: "Toda la América española lo mismo que Andalucía i Estremadura . . . conservan el nombre antiguo i lejítimo de *papa,* de modo que en Chile es absurda la pretension de ciertos literatos 'academizantes' de querer sustituir la denominacion propia americana por la 'impropia' española, debida a un simple error de los peninsulares."

significance was consequently applied to them. This term reached Clusius, and hence the French-German appellations *tartoufle, tartuffel, cartoufle, kartoffel.* England was spared this continental invasion, and adhered to her *potato,* alleged by Gerard to have been introduced from "Virginia."

In regard to the origin of the curious form *kartoffel,* German philologists have attempted many explanations, but without reaching any satisfactory result (Spitzer, pp. 156–158). F. Kluge (p. 187) holds that *kartoffel* originated by way of phonetic dissimilation from *tartuffel,* which, in his opinion, occurs between 1650 and 1760.[1] This view of so late an origin of the *k*-form cannot be correct, for *cartoufle* appears for the first time and as early as 1600 in Olivier de Serres *[1802, vol. 3, p. 173]. According to Spitzer, the change of the initial from *t* to *k* was accomplished in Germany, because the corruption of a Romanic word is rather intelligible in a non-Romanic language; and he seeks comfort in the fact that Olivier received the potato from Switzerland, which, in his opinion, must be German Switzerland. These arguments certainly are feeble and prove nothing in the way of facts. The doublets *tirituffulu* and *catatuffulu* in Sicilian show well that an alternation of *t* and *k* is possible in a Romanic dialect. The only outstanding fact remaining is that *cartoufle* made its debut in France at a time when this word was unknown in Germany, or, at least, cannot be proved to have then existed in Germany or Switzerland. Southern French *kartufle* and Namur *kartuš* demonstrate that the *k* form is of French origin. According to M. Heyne *[vol. 2, p. 297], the form *kartoffel* is first recorded by Adelung in the middle of the eighteenth century, and is accordingly a century and a half later than French *cartoufle.* In assuming that the Germans adopted it from the French, it is curious that, with the exception of dialects, it has vanished in France, while in Germany it finally superseded all other designations, and has become the proper word of the written language and cultivated speech. Again, while the type "truffle" predominates in France, there is not a trace of it in German dialects; merely the French word came to Germany, without any consciousness of its etymological origin.

It is not clear that German *erdapfel,* as assumed by Kluge *[p. 187], is traceable directly to Dutch *aardappel* and French *pomme de terre.* The word *erdapfel* pre-existed in Middle High

[1] This word, however, is used by J. Beckmann (vol. 1, p. 434) as late as 1782. Kluge asserts also that the dialectic form *pataken* is based on Spanish-Italian *patata;* in fact, it is traceable to Spanish *pataca.*

German (*ertapfel*), and, for instance, is applied by Konrad von Megenberg, in his *Das Buch der Natur* (1349–50, pp. 391, 407, 603), both to *Citrullus* and the mandrake.[1] What Kluge overlooks is the fact that German *erdapfel* originally did not at all refer to the potato, but to the tubers of *Helianthus tuberosus*, and that only in the eighteenth century was the word transferred to the potato. French *pomme de terre*, as shown above, is a recent term, and first appears in 1716.

In most countries of the Old World the newly introduced potato was compared with species of *Dioscorea* and *Colocasia* (taro and yam), and we receive such designations as "foreign taro," "Holland yam" in the Far East. Chinese terminology foreshadows the foreign character of a plant which is not much appreciated in China. Both in China and in the Malay Archipelago "Holland" figures in the nomenclature, and the Dutch term *aardappel* has penetrated into Malayan regions as well as into India and Japan.

[1] According to Heyne, it also applied to a melon (Latin *pepo*, German *pfebe*); what he calls a kind of artichoke is *Helianthus tuberosus*.

APPENDIX II. WORLD STATISTICS OF THE POTATO

POTATOES: PRODUCTION IN SPECIFIED COUNTRIES (1934–35 TO 1936–37) AND VALUE (1934–35)

(From the United States Department of Agriculture)

COUNTRY	PRODUCTION (*In 1,000 bushels*)				VALUE (*$1,000*)
	Average 1925–26 to 1929–30	1934–35	1935–36	*1936–37	1934–35
NORTHERN HEMISPHERE					
North America					
Canada	74,579	80,158	64,450	65,105	23,822
United States	349,434	406,105	386,380	329,997	181,857
Total	424,013	486,263	450,830	395,102	.....
Europe					
Austria	83,216	101,020	87,908	91,836	.....
Belgium	124,585	119,851	110,448	.....	.....
Czechoslovakia	310,025	351,757	282,094	341,577	.....
Denmark	36,243	50,447	45,282	.....	.....
Estonia	26,245	32,780	32,800	35,804	.....
Finland	27,522	41,865	46,629	48,596	.....
France	523,939	611,891	526,156	591,928	343,117
Germany	1,400,991	1,718,876	1,518,621	1,691,749	.....
Hungary	72,221	77,848	51,171	97,813	23,820
Irish Free State	87,856	94,999	96,218	.....	.....
Italy	72,837	99,636	79,332	.....	.....
Latvia	28,477	53,124	53,688	45,815	.....
Lithuania	53,809	91,606	65,174	74,675	.....
Netherlands	121,249	108,031	97,704	80,100	.....
Norway	31,592	29,415	33,674	37,299	.....
Poland	972,152	1,229,815	1,194,222	1,175,044	163,206
Rumania	75,865	76,118	69,629	.....	.....
Spain	‡139,671	177,152	177,716	.....	.....
Sweden	63,397	71,371	63,957	68,746	.....
Switzerland	25,691	31,055	24,927	21,311	.....
Union of Soviet Socialist Republics	1,602,822	2,063,874	.....	.....	.....
United Kingdom	198,501	201,112	171,964	166,205	†58,557
Yugoslavia	41,930	66,955	49,656	.....	.....
Total for European countries reporting production, all years	3,939,027	4,751,565	4,250,689	4,568,498	.....
Estimated European Total	6,135,000	7,537,000	6,708,000	7,178,000	.....
Total for Northern Hemisphere countries reporting all years	4,363,040	5,237,828	4,701,519	4,963,600	.....
Estimated Northern Hemisphere Total	6,633,000	7,626,000	6,864,000	7,242,000	.....

*Preliminary. †Output value for England and Wales. ‡Four-year average.

POTATOES: PRODUCTION IN SPECIFIED COUNTRIES (1934–35 TO 1936–37) AND VALUE (1934–35)—*Continued*

COUNTRY	PRODUCTION (*In 1,000 bushels*)				VALUE (*$1,000*)
	Average 1925–26 to 1929–30	1934–35	1935–36	1936–37	1934–35
SOUTHERN HEMISPHERE					
Argentina	29,325	28,504	12,710	.....	.....
Australia	13,315	10,661	.....	.....	.....
Chile	13,557	16,993	15,179	.....	.....
Estimated Southern Hemisphere Total	112,000	136,000	120,000	.....	.....
Estimated World Total	6,745,000	7,762,000	6,984,000	.....	.....

Production figures refer to the year of harvest. Harvests of the Northern Hemisphere are combined with those of the Southern Hemisphere which immediately follow; thus for 1934–35 the crop harvested in the Northern Hemisphere countries in 1934 is combined with the Southern Hemisphere harvest which begins late in 1934 and ends early in 1935.

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Abbreviations

AA	American Anthropologist
AFSM	Annales de la Faculté des Sciences de Marseille
AM	Atlantic Monthly
AMG-BE	Annales du Musée Guimet, Bibliothèque d'Etudes
AMNH	Annals and Magazine of Natural History
ASSC	Actes de la Société Scientifique du Chili
BAE-B	Bureau of American Ethnology, Bulletins
BAE-R	Bureau of American Ethnology, Annual Reports
BEFEO	Bulletin de l'Ecole Française d'Extrême-Orient
BGA-V	Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschicht: Verhandlungen.
BPMN	Bulletin of the Public Museum of the City of Milwaukee
CR	China Review
CRMJ	Chinese Recorder and Missionary Journal
DA-RT	Devonshire Association, Reports and Transactions
DIBGL	[Philippine Islands] Department of Interior, Bureau of Government Laboratories
DOA	Deutsch-Ost-Afrika
GC	Gardener's Chronicle
HSP	Hakluyt Society Publications
ICA	International Congress of Americanists, Proceedings
IF-M	Institut de France, Mémoires
IRGO-PO-Z	Imperatorskoe Russkoe Geograficheskoe Obshchestvo. Priamurskiĭ Otdel. Zapiski.
JASB	Journal of the Anthropological Society of Bombay
JH	Journal of Heredity
JLS-B	Journal of the Linnean Society, Botany
JNCBRAS	Journal of the North China Branch of the Royal Asiatic Society
JRAI	Journal of the Royal Anthropological Institute of Great Britain and Ireland
JRAS	Journal of the Royal Asiatic Society of Great Britain and Ireland
LHS-T	London Horticultural Society, Transactions
LJ	Landwirtschaftliche Jahrbücher
MAAA	Memoirs of the American Anthropological Association
MAI-IN	Museum of the American Indian, Indian Notes and Monographs
MDGNVO	Mitteilungen der Deutschen Gesellschaft für Natur- und Völkerkunde Ostasiens
MGMN	Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften
NASGA	Neues Archiv für Sächsische Geschichte und Altertumskunde
NYSMB	New York State Museum Bulletin
NZDM	New Zealand, Dominion Museum
PANSP	Proceedings of the Academy of Natural Sciences of Philadelphia
PAPS	Proceedings of the American Philosophical Society
PM-E	Petermanns Mitteilungen, Ergänzungsheft
SI-R	Smithsonian Institution, Annual Reports
SM	Scientific Monthly
TP	T'oung Pao
USNM-R	United States National Museum, Annual Reports
WS	Wörter und Sachen
ZE	Zeitschrift für Ethnologie

*[In the following bibliography items preceded by the asterisk have not been seen by C.M.W. Information within brackets has been added after consulting standard bibliographies and catalogues.]

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