

Michel Conan, *Dumbarton Oaks*
&
W. John Kress,¹ *Smithsonian Institution Department of Botany*

These studies of "Botanical Progress, Horticultural Innovations and Cultural Changes" constitute a renewed attempt at understanding the history of relationships between plants and humans in response to urgent concerns about contemporary landscape design. Present-day environmentalism in landscape architecture recommends that humans not interfere with plants at all, and we certainly wish, at the same time, to preserve much of wild nature, and use all sorts of cultivated plants in daily life. This begs a question that is not answered by environmental discourse: What kind of relationships should humans entertain with cultivated plants?

Botanical Progress

However, before we go any further, we should take into account that the knowledge of plants and the view humans take of their existence and number have changed over the last centuries. Humanity's view of nature and the accumulation of knowledge about the natural world can be traced back through many ancient cultures, and certainly the use of plants has varied over time and across continents. In Western cultures, museums, botanical gardens, and herbaria have traditionally been the academic centers for the study of plant life. Early botanical gardens established in Italy in the Renaissance, and Spain before the tenth century A.D.² set the stage for the development of later natural history institutions in Europe. In the eighteenth and nineteenth centuries, botanical institutions began to flourish in Europe and North America as exploratory expeditions returned from far away lands bringing with them many plant species new to science. The age of discovery of nature in turn gave way to the development of new schemes for classifying plants and eventually an understanding of the evolutionary principles responsible for the process of speciation and their origin.

At the start of the great age of exploration by European naturalists in the eighteenth and nineteenth centuries, nature seemed mysterious, immense, and infinite. Expeditions to explore uncharted regions of the world were sent out by governments, monarchies, and wealthy patrons to survey and acquire new lands, to bring back new plant products, such as spices and medicines, and to collect natural history specimens for newly established national museums as well as private collections. Most of the preserved and living specimens of plants that were brought back from Africa, South America, and Asia to museums and botanic gardens by such explorers as Alexander von Humboldt, James Cook, Charles Darwin, Ernest Henry

Wilson, Frank Kingdon-Ward, and Charles Wilkes, to name only a few, were new to science and to horticulture. Discovery and description of biodiversity proceeded at a pace as if the natural world were limitless, enduring, and permanent. Botanists at botanic gardens at Kew, Edinburgh, Madrid, Berlin, St. Petersburg, Singapore, and Bogor, at natural history museums in Paris, London, Leiden, and later Washington, as well as universities at Uppsala, Oxford, and Harvard proceeded to describe new species of plants at a frenzied pace, especially from the tropical regions of the world. The great age of exploration starting in the eighteenth century resulted in an explosion of discovery and documentation of biodiversity in the nineteenth and twentieth centuries.

The initial period of global exploration was soon followed by the colonization of these regions in the Americas, Africa, and Asia at an unprecedented rate by Europeans. In Europe the expanding populations, disease epidemics, economic hardships, and religious persecution sent hundreds of thousands of people to these newly opened regions that promised limitless opportunities and riches. The massive, unspoiled landscapes encountered by European settlers to North America, for example, were viewed as an endless, natural garden to be cultivated and exploited, regardless of the native peoples that inhabited these lands.³ Yet at the same time this wilderness was forbidding and frightening to these early colonists. In response to both of these perceptions, limitless bounty but frightening wilderness, the woodlands were felled, crops were planted, towns and cities grew at the great expense of the natural landscapes. The slow but steady threat to the survival of native species in the New World had begun.

As the nineteenth and twentieth centuries progressed through unbridled expansion of human populations throughout the world, biologists began to realize that natural habitats, landscapes, and even species were indeed limited, transitory, and ephemeral. The abundance of discoveries of species that started in the eighteenth century led to an intense period of descriptions and taxonomic analysis in the nineteenth and twentieth centuries. The tremendous influx of new species being described required an overhaul of the earlier classification system of Linnaeus (1753).⁴ Major new classification systems of plants to incorporate the new discoveries were proposed first by the French botanist de Jussieu (1789),⁵ followed by the British taxonomists Bentham and Hooker (1862–1883)⁶ and later the Germans Engler and Prantl (1887–1915).⁷

After the turn of the nineteenth century, Darwin's theory of evolution through natural selection and the developing field of genetics preoccupied a different set of biologists in their investigations of the natural world. In the 1940s and 1950s a significant decrease took place in the description of new species of plants, perhaps as a result of the international effects of World War II. This decrease of new discoveries was coupled with an increase in the reanalysis of the taxonomic hierarchy and relationship of taxa to reflect new ideas on the nature of species resulting from a new synthesis of evolutionary ideas led by biologists Theodosius Dobzhansky, Ernst Mayr, George Gaylord Simpson, and George Ledyard Stebbins Jr.⁸ The intense interest by evolutionary biologists in understanding how species are related to each other, initiated in the 1940s and termed phylogenetics, has persisted to the present day. New technological advances using DNA sequence data have revolutionized our concepts on the phylogenetic relationships of plants and a new classification of flowering plants is gaining wide acceptance.⁹

At the same time that taxonomists and evolutionists were trying to understand the evolution and classification of plants, ecologists and environmentalists were beginning to assess the relationship of people to natural habitats. Aldo Leopold and others in the 1940s were early advocates who clearly saw the threat of unbridled human expansion to natural environments and the species that inhabited them. It was not until the 1970s that a significant realization was made by most biologists, ecologists, and taxonomists that the natural world was under threat and in trouble. In the last three decades of the twentieth century the

urgent need to understand and protect the Earth's habitats and organisms has resulted in an explosion of new academic programs aimed at studying the environment, of new professional societies (e.g., the Society for Conservation Biology) and local activist groups to unite scientists and citizens in taking action, and even new legislation (e.g., the Endangered Species Act) to turn concern for the environment into law.

At the turn of the twenty-first century, it has become clear to biologists, conservationists, and a significant segment of the general public that a major extinction of plants, animals, and microorganisms caused by human activities is not only possible but probable unless immediate action is taken. This threat has resulted in the creation of many local, regional, and national government and nongovernment organizations devoted to halting and reversing these activities. One international response to this imminent extinction as a result of increasing degradation of the environment was the Convention on Biological Diversity (CBD) authorized at the Earth Summit in Rio de Janeiro, Brazil, in 1992. This treaty initiated a revolution in the value placed on biodiversity and the intellectual property rights attached to nature. According to the Convention, biodiversity should be conserved, sustainably used, and its benefits shared among all parties. Since the Rio Summit, 188 countries have signed the treaty and a host of additional resolutions, national strategies, and work plans have been developed and implemented. Although not the initial intent, one result of the CBD was that nature, like other commercial commodities, has now become internationalized. The ownership of nature, whether it be for natural product development through "bioprospecting," establishing logging concessions on indigenous people's land, or collecting plant specimens for scientific study, is now a matter of worldwide concern and law.

The globalization of nature and biodiversity coupled with increased species extinction has significantly changed the way that modern-day plant explorers and taxonomists pursue their activities. As habitat destruction accelerates, the pace of discovery, identification, and description of new species of plants has not sped up. The number of newly described species of plants only slightly increased in the 1980s and 1990s over the previous four decades. Unlike the predominant perceptions of the seventeenth and eighteenth centuries that nature and species were infinite and limitless, we now know this assessment is not true. Estimates of the number of plant species currently present on Earth range from 220,000 to over 420,000¹⁰. By extrapolation from what we have already described and what we estimate to be present it is possible that at least ten percent of all vascular plants are still to be discovered and described.¹¹ This number suggests that a considerable amount of work still needs to be done by botanists to find them.

The marriage of biology and advanced technology is leading to the development of novel tools with the potential to transform current methods of plant collecting, such as image recognition software to be employed in electronic field guides and on-the-spot, rapid DNA sequencing, termed DNA bar coding¹² for species identification. These technological tools will define and drive the new plant explorers of the future. The documentation of the remaining species of plants with the aid of these new tools will provide a solid basis for the precise identification of the species-rich areas of the world for immediate assessment, conservation, and protection. The social, economic, political, and technological changes of the last few decades have ushered in the final age of plant exploration and conservation in the twenty-first century. We can also see that cultural and scientific changes such as new developments of genetics allow the creation of new cultivated plants, and new forms of the exploitation of plants. This will have a great impact on landscape architecture, as much as economy or medicine. Conversely, we know that large agricultural changes in eighteenth-century England, for instance, had a profound impact on English society, and some of its colonies. Clearly, mutual relationships between cultivated plants and human cultures have developed in many ways during the past millennia, and might develop in different ways in our own future.

Turning to the Study of Agriculture

Yet we lack a broad historical perspective on the relationships between humans and plants that would allow us to think about possible futures. This is not, however, revelation. The question of these relationships goes back to the end of the nineteenth century with the groundbreaking work on the origins of cultivated plants by Alphonse de Candolle, a study of archival documents and ancient languages published in Geneva in 1882.¹³ This impressive work is at the origin of the diffusion theory of agriculture that rests on the idea that hunter collectors had been pushed by hunger towards agriculture after they had depleted their hunting and collecting grounds of most of their natural resources.¹⁴ This thesis contributed to focusing scholarly research upon the quest for the origin of agriculture, diverting it from broader ranging studies of relationships between plants and humans.

This approach, however, ran into difficulties that invited approaching the question from a completely different point of view, putting horticulture rather than agriculture, and historical rather than prehistorical periods at the center of our discussions. Studies of the origin of agriculture went through different phases. Several scientific disciplines contributed one after the other, bringing new facts to light and overthrowing old ones. The necessity to struggle with scarce evidence seems to have made the mystery of origin more obscure as research progressed, and led to the development of imaginary models of the social use of plants in archaic times. Let us see how.

The use of botanical tours and comparative linguistics, in the 1880s, limited the time range explored by Candolle to 4–3000 B.P. Between 1921 and 1943, Nicolay Ivanovich Vavilov, his team and their followers¹⁵ turned to botany.¹⁶ They called on modern botany of their time to understand the processes of transformation of wild into cultivated plants. And they replaced scientifically obsolete categories of pure, mongrel, or hybrid races of degeneration or atavism that were and still are used in lay discussions of domesticated plants, with concepts borrowed from genetics, such as dominant or recessive genes, homozygous or heterozygous plants. It enabled them to study the role of human intervention in the transformation of the biological life of plants. It also steered discussions of plant biology away from the dreadful discourse of race in human affairs. They wanted to discover on site the origins of plants that were used to develop agriculture. They also thought—like Candolle—that the sites of the origins of cultivated plants would coincide in the majority of cases with the places where agriculture was initiated. After a very large number of botanical investigations all around the world, they concluded that agriculture originated in a small number of geographical regions of the world. These were mountainous areas on the fringes of tropical and subtropical regions in East Asia, Southeast Asia, the Caucasus and Asia Minor, Central American highlands, and the Andes. In 1943 André Haudricourt and Louis Hédin, following in his footsteps, published a study of “the tight and reciprocal relationship between Man and cultivated plants.”¹⁷ They defined agriculture as “the intentional planting of seeds or tubers towards a larger crop,” and located its origin at the beginning of the Neolithic, about eight to ten thousand years ago. Their definition of agriculture covers horticulture as well, and many scholars accepted without further inquiry that horticulture developed as a branch of agriculture after this date.

The botanical approach of plant variety to determine the center from which agriculture originated and to determine the origin of specific crops stimulated a great amount of research, which ultimately produced contradictory reports. These contradictions led to a search for hard archaeological evidence that would establish the true origin of agriculture, and researchers

lost sight of the broader question about the history of mutual relationships between humans and plants. In 1994, only ten years ago, Daniel Zohary and Maria Hopf published a survey of more than twenty different archaeological types of evidence. They concluded that: "... it is evident that the crops domesticated in the Near East nuclear area were also the initiators of food production in Europe, central Asia, the Indus Basin and the Nile Valley ... All over those vast areas the start of food production depended on the same Near Eastern crops."¹⁸ Thus archaeology seemed to confirm the classical diffusion theory. Yet, even on archaeological grounds, this conclusion was debatable since there is evidence of grain grinding implements from 20,000–15,000 B.P. in the Nile valley in Africa. And, in 1993 David Phillipson, using botanical evidence, concluded that "Most of the crops which are or have been cultivated in Africa are species indigenous to that continent (. . .) which must presumably have been first cultivated there."¹⁹ Moreover, the theory did not apply easily to the development of agriculture in America.

Did Cultural Changes Matter?

Competing directions of research had been pursued during the same period. Carl Sauer already argued against the classical diffusion theory in 1952, saying "... People living in the shadow of famine do not have the time to undertake the slow and leisurely experimental steps out of which a better food supply is to develop in a somewhat distant future ... Needy and miserable societies are not inventive."²⁰ Instead, he pictured a shift from hunting and nomadism to fishing in sedentary places that fostered the development of a relationship with trees providing fibers for making nets and fishing implements as well as baskets, and with poisonous plants for stunning fishes. He proposed that women had begun a special relationship with plants mostly for fibers and possibly medicinal and magical purposes long before any plant would have been an important staple in a new food economy. His model no longer centered on the origins of European culture, but started with garden cultivation in south Asia and south China along rivers, lakes and estuaries. This suggested a new line of investigation that called on the reconstruction of social and cultural dynamics of relationships between humans and plants. Unfortunately, it rested more on imagination than observation of actual human behaviors. Instead, rather than try to imagine the relationship to nature of small societies ten thousand years ago, it seemed wise to carry field observations of present-day preagricultural societies.

Eric Higgs and Margaret Jarman in 1969 and 1972 also rejected the economic line of reasoning that interpreted change in the relationships between man and nature as a response to nutritional needs.²¹ They proposed instead that changes in the relationships between man and nature had taken place incrementally in response to local or regional changes in the environment, climate, demography, warfare, religion, or skills. Moreover, they called attention to the reversibility of change, noting that agriculturists under political pressure could revert to hunting and gathering as it happened in South America under the duress created by the European colonization. Their criticism also exposed the anachronism that was built into the question of the origins of agriculture. In order to answer that question it had been necessary to outline a number of criteria that should be met for agriculture to exist. Three conditions were commonly accepted: (1) the existence of domesticated plants, (2) systematic planting practices, and (3) the use of specialized planting areas. Of course, these conditions make sense as a way of defining contemporary agriculture. If we think that the course of history was guided by economic necessity toward the present form of exploitation of natural resources it is perfectly reasonable to search for the moment in the past when this model was first introduced. And, conversely, when forcing past evidence to fit this model we inadvertently introduce the assumption that

our form of exploitation of nature results from a necessary development of the relationships between men and nature. In fact, we do even more. When describing the steps of human evolution as a series of necessary passages from one form of relationships between men and nature, from scavenger to farmer in the early Neolithic, we claim that the present industrial agriculture is the necessary result of a ten-thousand-year-old course of development, and thus cannot be replaced. We create a myth that supports the belief in the necessity of the present model of use of nature.

Several anthropologists, many of them ethnobotanists, have done so. Their works raise fascinating issues. Philippe Descola in his study of the Achuar in 1986 showed them to be hunters, fishermen, and horticulturists.²² He highlights the large botanical knowledge transmitted across generations, and the specialization of women's botanical knowledge of cultivated plants. Men alone practiced hunting, men and women fishing, and women gardening, while men cultivated a few poisonous plants for hunting and fishing outside of the gardens. In fact men could not enter the gardens for magical reasons, much less manage them. Moreover, each plant was cared for, as a child of hers, by a woman who knew the relevant magic to apply in any circumstance. We can conclude with other ethnobotanists that "Knowledge of planting in and of itself does not mandate a social transformation of so-called hunter-gatherers to farmers."²³ The Sawiyamö are also hunters and horticulturists, cultivating taro, yams, sweet potato, sago palm, plantains, coconut, pandanus, betel, and vine in several swidden lots in the forest. It is interesting to note that the garden lots are not fenced and are used as bait to hunt wild pigs coming from the forest to forage into them. But I should insist on the commonly observed fact that gardening—like hunting and fishing—seems to demand magic practices and cultivation of plants for magic, to a degree that varies greatly from one culture to another and that eludes any known pattern. The understanding of relationships between plants and humans in non-Western civilizations demands a detailed understanding of local cultures and social organization as demonstrated by many studies since Malinowski's "Coral Gardens and their Magic,"²⁴ in 1935. Yet these studies suggest so many different models of man-to-nature relationships that it would be vain to choose one rather than the others to account for the origins of early agriculture. The question of the origins of agriculture should be laid to rest for a while!

Returning to Garden Studies with New Questions

By contrast, these studies provide fascinating insights into the mutual relationships between the knowledge of plants, their cultivation, and local culture in the anthropological sense. There is, however, no reason to believe that we could learn about the mutual relationships of humans to plants only by turning to examples outside of Western society. Instead, we have much to learn from a systematic study of all aspects of the history of relationships between plants and humans that we can retrieve from the past, paying much attention to cultural changes. We should roam through the whole of the historic periods of mankind, including the present, without any preconception of a question on which all thinking should be focused. Rather we should explore very different approaches to the relationships between humans and plants in very different cultural, environmental, and historical contexts, hopefully to discover some promising questions for further explorations.

To help discover new questions, this book puts horticulture rather than agriculture at the center of inquiries. How should we then define horticulture? In a rather intriguing paper on "Domestication of animals, cultivation of plants and management of people," André Haudricourt suggested a radical difference between agriculture and horticulture.²⁵ Horticulture expresses respectful care for each plant, acts mostly indirectly upon them, and always handles them individually, as opposed to agriculture,

which proceeds to mass-management of plants, acts directly upon them, and engages in violent treatment such as reaping and flaying. Then, he went on to propose that agriculture and pastoralism were correlated to the Indo-European political style of management, in the same way that horticulture was correlated to the Chinese political style of management. His view of horticulture was exemplified in the cultivation of taro in Melanesia, and by the art of Chinese gardens. It replaces Euro-centered with Asian-centered perspectives. As a result, he saw the French garden as typical of the agricultural management of nature, putting into question the relationship between gardens and horticulture. Such a definition of horticulture, however, is not helpful because it unduly generalizes from an Asian practice of the relationships between humans and plants. It should serve as a warning that we should be open to the varieties of mutual relationships between plants and humans that have developed, and use whenever possible local or regional categories for the description of places, plants and planting. Moreover, we should not restrict the domain of our discussions to edible plants, or to any category of plants but, rather, remain open to studying any plant that has been associated with humans.

We wish to seek how cultural modes of understanding of plants and societies may interact, and how they relate to the history of different practices in gardening, religion, literature, economy, or politics, as well as in region or environment. Rather than follow Haudricourt's structuralist interpretations, we should examine how cultural modes of understanding of plants and societies may interact, and how they relate to the history of different practices in gardening, religion, literature, economy or politics, as well as region or environment. This is why this volume is far-ranging in the periods and the issues of human history it addresses, and attempts to unravel different kinds of relationships between the construction of knowledge, the cultivation of plants, and the processes of cultural and social change. It is divided into three directions of exploration of linkages between botany, horticulture, and cultural changes. The chapters are presented in historical order for reasons of clarity and certainly not to suggest any pattern of cultural diffusion across the world.

The first part revisits ancient links between culture, botany and horticulture. Addressing the period of the late Republic and Early Roman Empire, Alain Touwaide shows the importance of plant classification for the organization of Roman gardens. The Islamic world further developed the knowledge of plants and gardening, and Elliot Wolfson for Medieval Andalusia, and Maria Subtelny for the Persian world, show how these early forms of botany and horticulture opened the way to extraordinary developments of mystical culture and poetry. Nurhan Atasoy, clearly setting apart the Ottoman from the Andalusian, Arabic, and Persian garden traditions, shows a completely different realm of mutual influence between flower cultivation, gardening, and developments in the visual arts. Then she takes her topic a step further into a study of the flower's role in cultural encounters and exchanges between Western Europe and the Ottoman Empire. In the fifth chapter, Susan Toby Evans, guiding our attention from the Mediterranean to the Meso-American world just before its dramatic encounter with European powers, further illustrates the variety of links between culture and horticulture.

The second part explores links between horticultural and political changes. The topic seems narrower and yet the variety of links that can be observed still appears considerable. Here again, the chapters each concentrate on some very different aspects of gardening. Yizhar Hirschfeld shows the importance of perfumes for Palestine in the Roman times, while Mohammed El Faiz, turning to the long history of Muslim Spain, shows the dynamic relationships between politics, experimental development of horticulture, and progress of plant knowledge and collecting. In a completely different vein, Wybe Kuitert shows how selection and hybridization of plum and cherry blossoms in medieval Japan was directly linked to political changes. Georges Métaillé

provides another completely unexpected example of such links, with the development of a science of grafting in Yuan China; and Saúl Alcántara Onofre provides a similar interpretation for the development of floating gardens in Tenochtitlan, and later Mexico D.F. Thus, we are invited to acknowledge the economic or symbolic importance of technical gestures in horticulture—hybridization, grafting, making floating gardens—and to recognize the role of political choices for their development in each historical context.

The last part offers an attempt at exploring an even more limited set of linkages, turning to horticulture's contribution to economic and cultural changes. Mauro Ambrosoli sets the tone for this part, showing the role of vernacular gardens and gardening in Italian agricultural estates since the times of the Renaissance; Michel Conan examines the complex relationships between horticultural and agricultural modernization before the French revolution and the ensuing development of utopian views of social reform predicated on new discoveries in horticulture and the introduction of new plants coming from America. Therese O'Malley shows under which conditions, in the period just following the American Revolution, horticulture and garden design became established on this side of the Atlantic. Returning to the Islamic world, Daniel Martin Varisco shows how a specific plant provided a drug that has fashioned the economy and the culture of Yemen. It introduces one of the wonderful mysteries of this history of relationships between humans and plants that invites us to reflect upon the huge variety of possible relationships: this plant has become an integral part of Yemeni culture but did not originate in Yemen and failed to spread beyond the borders of the country. Finally, Peter del Tredici turns to the contemporary views of an ideal relationship between humans and plants that would be based on a rehabilitation of the ecologies that prevailed before humans began interfering. He shows that this is just another haphazard form of horticulture. Even left to themselves, natural species tend to compete in unpredictable ways. And in any case, humans cannot be active in preserving nature and pretend that other actions by the rest of society can be bracketed out. Relationships between humans and nature demand much more research before we can claim a horticultural knowledge that could establish sustainable relationships between nature and societies all around the world.

Plants all over the world display the formidable impact that human life has had upon the course of other natural beings. All beliefs in a simple course of change that could be explained by reducing human life to a functional—mostly economic—necessity have to be discarded. Plants, like *Rosa centifolia* in Persia, *Prunus mume* and *Prunus serrulata* in Japan, or the maize and the *cempazúchi* in the chinampas of Tenochtitlan, have migrated into all sorts of aspects of local cultures in symbolic forms that derived from their cultivation for economic reasons, and their history—still to be told—will not be disentangled from human history. Domesticated plants have provided some of the building blocks from which human cultures have been constructed, and for that reason played a deep role in the changes of their arts, economies, and politics. Many chapters of this book, however, testify to long-lasting relationships between different plants and their host society of humans that depended on the stability of a highly significant cultural form. Some changes in relationships between humans and plants were willfully planned as the multiplication of citrus fruit trees in the large gardens of Andalusia, but many plans did fail. In that respect, the present utopia of ecological rehabilitation of the earth seems to simply invert the enlightenment utopia of a ubiquitous presence of all plant species in everybody's garden! Yet, we can see, as in the case of spreading plants in the Italian countryside, that many changes were involuntary, and resulted from the unpredictable interlacing of human passions. There is no tentative conclusion to this volume. On the contrary, we think of it as inviting further discussions and research, before some fruitful questions can

be raised for investigation. We hope at least you will find it tantalizing to start thinking about ways of better understanding or creating better relationships between humans and plants.

NOTES

- ¹ Part of this joint essay has been adapted from the final chapter of Gary A. Krupnick and W. John Kress (ed.), *Plant Conservation: A Natural History Approach* (Chicago: University of Chicago Press, 2005).
- ² See Mohammed El Faiz (Cedimes University, Morocco), *Horticultural Changes and Political Upheavals in Middle-Age Andalusia*, in this volume.
- ³ Philipp Shabecoff, *A Fierce Green Fire: The American Environmental Movement* (New York: Hill and Wang, 1993).
- ⁴ Carl Linnaeus, (1753) *Species Plantarum* (Stockholm: 2001).
- ⁵ Antonii Laurentii De Jussieu, *Genera plantarum secundum ordines naturales disposita: juxta methodum in horto Regio Parisiensi* (Parisii: Apud Viduam Herissant et Theophilum Barrois, 1789).
- ⁶ George Bentham and Joseph Dalton Hooker, *Genera plantarum ad exemplaria imprimis in herbariis kewensibus servata definita*; (London Reeve and Co. v.1, pt. 2-v. 3. 1862–1883).
- ⁷ Adolf Engler and Karl Anton. Prantl, *Die Natürlichen Pflanzenfamilien nebst ihren Gattungen und wichtigeren Arten, insbesondere den Nutzpflanzen, unter Mitwirkung zahlreicher hervorragender Fachgelehrten*. Nachträge II zum II.–IV. Teil, über die Jahre 1897 und 1898 (Leipzig: Wilhelm Engelmann, 1900).
- ⁸ Ernst Mayr and William B. Provine, *The Evolutionary Synthesis: Perspectives on the Unification of Biology* (Cambridge, Mass.: Harvard University Press, 1980).
- ⁹ Angiosperm Phylogeny Group [APG]. "An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II." *Botanical Journal of Linnean Society* 141:399–436. 2003.
- ¹⁰ Rafael Govaerts, "How many species of seed plants are there?" *Taxon* 50(4):1085–1090. 2001. Robert W Scotland, and Alexandra H. Wortley, "How many species of seed plants are there?" *Taxon* 52:101–104. 2003.
- ¹¹ W. John Kress and Ellen Farr, unpublished data.
- ¹² W. John Kress, "Paper floras: How long will they last? A review of *Flowering Plants of the Neotropics*." *Amer. J. Bot.* 91: 2124–2127. 2004.
- ¹³ Alphonse de Candolle, *Origin of cultivated plants* (New York: Hafner Pub. Co., 1959). Alphonse de Candolle: 1806–1893.
- ¹⁴ Candolle, *Origine des plantes cultivées*, Genève, Slatkine, 1984 (2–3). "Let me come back to the species that savages may be inclined to cultivate. Sometimes they find them in their own country, but they often get them from neighboring people better served by natural conditions or already engaged in some civilization process. . . . History shows that wheat, corn and sweet potato (. . .) as well as several other plants quickly spread before historical times. (2) (. . .) The different causes that favored or acted against the beginnings of agriculture well explain why there have been agriculturists in some regions since thousands of years, while other regions are still inhabited by nomadic tribes. . . . This eventually led to the formation of centers from which the most useful species have spread out. In the north of Asia, Europe and America, temperatures are unfavorable and indigenous plants are not very productive, but since hunting and fishing provided resources, agriculture could only penetrate at a later time, and people could do without good southern species without suffering too much." (3)
- ¹⁵ André G. Haudricourt and Louis Hédin, *L'Homme et les plantes cultivées*, Paris: A.M. métailié, 1943, ré-édition avec une préface de Michel Chauvet, (Paris, A. M. Métailié, 1987).
- ¹⁶ Nicolay Ivanovich Vavilov, *The origin, variation, immunity and breeding of cultivated plants: selected writings* (Waltham, Mass.: Chronica Botanica Co., 1951). N. I. Vavilov (ed.), *Bulletin of Applied Botany and Plant Breeding*, in Russian with English summaries, N. I. Vavilov (ed.), *Theoretical Bases of Plant Breeding*, (Moscow-Leningrad: State agricultural publishing house, 1935–1943).
- ¹⁷ See note 15.
- ¹⁸ Daniel Zohary and Maria Hopf, *Domestication of Plants in the Old World* (Oxford: Clarendon, 1994) quoted in D. J. McConnell, *The Forest Farms of Kandy, and other gardens of complete design* (Burlington (USA): Ashgate Studies in Environmental Policy and Practice, 2003), (428).
- ¹⁹ David W. Phillipson, *African Archaeology* (Cambridge: Cambridge University Press, 1993) quoted in McConnell, *The Forest Farms of Kandy* . . . (443).
- ²⁰ Carl Sauer, *Agricultural Origins and Dispersals* (New York: American Geographical Society, 1952) quoted by McConnell, (469).
- ²¹ Eric Sydney Higgs, Margaret R. Jarman, and others, *Early European Agriculture: Its Foundations and Development*, Written in Honour of Eric Higgs (British Academy, Major Research Project in the Early History of Agriculture. Cambridge: Cambridge University Press, 1982).
- ²² Philippe Descola, *Les lances du crépuscule: relations jivaro* (Haute Amazonie, Paris: Plon, ca. 1993). Philippe Descola and Gísli Pálsson (ed.), *Nature and society: anthropological perspectives* (New York: Routledge, 1996).
- ²³ Philip Guddemi, "When horticulturists are like hunter-gatherers: The Sawiyanö of Papua New Guinea," *Ethnology* 31: 303–314 Quoted in McClellan, *The Forest Farms of Kandy* . . . (466).
- ²⁴ Bronislaw Malinowski, *Conal Gardens and their Magic: A Study of the Methods of Tilling the Soil and of Agricultural Rites in the Trobriand Islands* (London, G. Allen & Unwin, 1935).
- ²⁵ André G. Haudricourt, "Domestication des animaux, culture des plantes, et traitement d'autrui," in *L'Homme*, 1962, #1, (40–50).