

The Botany of Desire Study Guide

The Botany of Desire by Michael Pollan

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Plot Summary

The text, usually categorized as a Nature and Gardening book, presents the argument that four plants have shaped human evolution at least to the same extent that humans have shaped those plants' evolution. The text uses the standard biological term "co-evolution" to describe this synergistic process. The four plants considered are the Apple, consisting of *Malus domestica* and *M. seiversii*; the Tulip, consisting of about 100 species in the genus *Tulipa*; Marijuana, consisting of the species *Cannabis sativa* and *C. indica*, as well as hybrids; and the Potato, or *Solanum tuberosum*. The text does not consider, or even apparently realize, the problematical approach of discussing co-evolution of species at generally the genus level. The bulk of the narrative consists of anecdotal experiences, personal observation, opinion and summarized topical history—which does not particularly support the major thesis.

The book is presented in four chapters, each considering a particular plant. Chapter 1 presents the apple tree, with a heavy focus on its edible fruit. The chapter generally considers the species *Malus domestica* but includes *M. seiversii*, said to be the primitive ancestor, in some discussions. A basic recounting of the natural history of the apple is presented in summary form, along with concise notes about the apple's historic importance in human civilization. The introduction of the apple to America is particularly well-developed, with a nearly complete focus on the activities of John Chapman, better known as Johnny Appleseed. The apple is said to have exerted a decisive impact on human evolution because it is able to satisfy *Homo sapiens'* desire for sweetness.

Chapter 2 presents the tulip, with a heavy focus on its flower. The chapter considers the entire genus *Tulipa* and does not mention any of the roughly 100 species comprising it. The text considers the evolution of tulips and the co-evolution of humans and tulips but unfortunately does not elucidate the complexities of evolutionary theory at the level of the genus—a major failing. A rudimentary explanation of tulip natural history is presented. This is supplemented with a recounting of the establishment of the tulip as a garden flower in Europe with a special emphasis given to Holland, especially during the period of so-called tulipomania in the early 1600s. A more concise account then focuses on the tulip in Turkey during the early 1700s. The tulip is said to have exerted a decisive impact on human evolution because it is able to satisfy *H. sapiens'* desire for beauty.

Chapter 3 presents marijuana. The chapter considers the species *Cannabis sativa* and *C. indica*, as well as hybrids. Additional materials consider other psychoactive drugs and the entire class is presented as an evolutionary unit. Thus, the text considers the evolution of marijuana and the co-evolution of humans and marijuana but unfortunately does not elucidate the complexities of evolutionary theory considered for multiple species and hybrids. A fairly-convoluted natural history of marijuana is offered with a heavy focus on American developments. The chapter is the longest in the text but most of the material presented is a subjective consideration of the effects of using marijuana as a drug; much of the writing is rambling and many undeveloped topics are jumbled together. Modern growing techniques are briefly described and the larger sociological implication of psychoactive drug use is considered. The presentation is sympathetic to



drug use and highly critical of American criminalization of marijuana and other psychoactive drugs. Marijuana is said to have exerted a decisive impact on human evolution because it is able to satisfy *H. sapiens*' desire for intoxication.

Chapter 4 presents *Solanum tuberosum* or the potato. A well-developed natural history of the potato, from the Andes to Ireland to Idaho, is presented in an eminently readable format. The potato's impact on various cultures is considered, and modern American farming techniques are discussed at considerable length. The author also presents personal experiences growing and eating various types of potatoes. An additional major topic considers the NewLeaf potato, a patented transgenic organism of the Monsanto Corporation. Portions of the chapter previously appeared in serialized format, and the additional rigor obtained through re-working for the book is evident. The potato is said to have exerted a decisive impact on human evolution because it is able to satisfy *H. sapiens*' desire for control.



Chapter 1

Chapter 1 Summary and Analysis

The text, usually categorized as a Nature and Gardening book, presents the argument that four plants have shaped human evolution at least to the same extent that humans have shaped those plants' evolution. The text uses the standard biological term "co-evolution" to describe this synergistic process. The four plants considered are the Apple, consisting of *Malus domestica* and *M. seiversii*; the Tulip, consisting of about 100 species in the genus *Tulipa*; Marijuana, consisting of the species *Cannabis sativa* and *C. indica*, as well as hybrids; and the Potato, or *Solanum tuberosum*. The text does not consider, or even apparently realize, the problematical approach of discussing co-evolution of species at generally the genus level. The bulk of the narrative consists of anecdotal experiences, personal observation, opinion and summarized topical history—which does not particularly support the major thesis.

Chapter 1 presents a scattered monograph regarding the apple, or fruit of the apple tree, *Malus domestica*. At 58 pages, it is the second-longest chapter in the text. Major topics considered include the origin of the apple; the Americanization of the apple; the activities of John Chapman, also known as Johnny Appleseed; and the role of the apple in American culture. None of the topics are developed exhaustively, and the approach to the material is more personal than rigorous. In other words, the chapter reads as a memoir regarding the apple. The chapter's themes are developed in parallel, interspersed segments, such that portions of Chapman's history are interspersed with portions of apple cultivar discussions. This construction creates a tone of informal narrative and provides accessibility to the text; however, it also gives the narrative a sort of wandering texture. The author presents material drawn from several sources, including personal interviews with William Ellery Jones and Phil Forsline. Jones is presented as an expert biographer on John Chapman, while Forsline is presented as an expert on Apple cultivation and genetics. The author presents Jones as a biased observer, who prefers the wholesome legend of Johnny Appleseed to the complex history of John Chapman.

The apple is presented as strongly appealing to humanity's desire for sweetness. The text states that *Malus* and *Homo sapiens* have a prolonged history of co-evolution and that human evolution has been strongly influenced by the apple—a trope on the general thesis of the text. No rigorous, Scientific approach to these assertions is attempted, however, and little evidence beyond theorizing is amassed. On the other hand, a very strong case is presented for human influence on the evolution of the apple. A considerable amount of information is provided regarding apple cultivation history and practices, as well as a brief discussion of cultivar development. The text positions apples as appealing to humans' desire for sweetness, but weakens this thesis by noting that throughout early history—up until perhaps the early 1830s—most apples were used to produce fermented cider. In fact, the theme of the apple's sweetness, while presented



as a dominant theme of the chapter, is not particularly well developed; it is considered only in a few well-written and insightful, but brief, passages.

The domestic apple, *M. domestica*, is thought to have derived from *M. sieversii*, endemic to Kazakhstan and common in the region of Almaty. The text does not discuss the intricacies of considering evolution at the genus level but confines itself almost entirely to the evolutionary details of *M. domestica*. The apple is historically the most-cultivated fruit and, in modern times, is second only to the banana. The apple is cultivated around the world and is probably the most-anciently cultivated fruit. The apple has been cultivated for so long that it has entered into mythological and religious beliefs, figuring prominently in Judeo-Christianity as the supposed fruit eaten by Eve and Adam in the Garden of Eden. The apple was introduced to North America with the initial waves of European colonization. Many European cultivars (varieties) did not thrive in North America, however, and regionally-developed cultivars compete favorably with European varieties. Many of the world's most-popular, modern apples are North American cultivars, including the Red Delicious and the Golden Delicious. Several early American cultivars were briefly commercially important, only to be replaced by latter cultivars.

The apple does not breed true from seed—that is, seed from a Red Delicious apple will not produce a tree bearing Red Delicious apples. Fruit from trees raised from seed displays an enormous variety of size, color, acidity, and sweetness. For this reason, virtually all apples grown for eating are cultivars—that is, trees produced by grafting a cutting from an existing cultivar onto a suitable rootstock. Thus, all Red Delicious-producing trees are clones of the original Red Delicious-producing tree, while all Golden Delicious-producing trees are clones of the original Golden Delicious-producing tree. Such widespread grafting of apples—indeed of all grafted plants—is greatly facilitated by plants' general ability to reproduce asexually.

Historically, the greatest active proponent of apples and apple trees is John Chapman, popularly known as Johnny Appleseed. Chapman (1774-1847) was an American pioneer and legendary proponent of the apple tree and introduced the species to several locations in Ohio, Indiana and Illinois. His activities were focused on the then-frontier of American expansion. Chapman is generally acknowledged as having planted at least tens of thousands of apple seeds across a wide range of orchards. Although presented as a highly-eccentric man—nearly a crank—with a single-mindedness bordering on mania, Chapman was financially successful and owned extensive orchard holdings. He raised apple trees for sale and subsequent transplantation and raised others in permanent orchards. As Chapman's trees were all raised from seed, they bore a range of fruit, most of which was not suitable for normal eating. He competed with apple cultivar sales because his trees and apples were cheap and because virtually all of his apple crops were used to make fermented cider—"hard" cider, in today's lexicon. Thus, the text suggests Chapman was a sort of alcohol proponent, peddling the raw ingredients for fermented cider and living a bizarre, rustic life akin to an American Dionysus. The comparison is not strained in development and thus, although inexact, adds an interesting dimension to the legend of Johnny Appleseed. Because Chapman's extensive plantings were from seed, the book suggests his many apple trees benefited from enormous variety, allowing the species to adapt to conditions in North America.



While certainly plausible, no evidence is offered to support the claim. The author notes several personal explorations of areas and locales important to Chapman history. Many peculiar aspects of Chapman's life are presented, including his Swedenborgian religion, but none of them are particularly relevant to the major themes. Chapman's treatment within the text is nearly unique, as his personal presentation rivals that of the chapter's ostensible subject, the apple.

Various apple cultivars are presented in the chapter, but none are fully described. The uniquely-American history of the Red Delicious and Golden Delicious apples are briefly considered. The Red Delicious was discovered by Jesse Hiatt in Peru, Iowa. Originally naming the variety Hawkeye, Hiatt entered the cultivar in a contest in 1893. The Hawkeye was the winning entry and the contest moderator, C. M. Stark, re-christened the variety the Delicious. Later, it was named the Red Delicious to distinguish it from the Golden Delicious. Today, the site of the original Red Delicious is marked by a granite monument. The Golden Delicious was discovered on a hillside in Clay County, West Virginia. C.M. Stark's brother, Paul, purchased the tree in 1914; it was subsequently enclosed in a padlocked steel cage and wired with a burglar alarm. The original Golden Delicious tree lived until the 1950's. Other American cultivars are named, though none are fully described. Apple cultivation is not covered, and the information presented regarding cultivars is usually more akin to sensationalist advertising than a useful comparison of varieties; in other words, the text is definitely not a gardener's handbook.

Modern apple research is conducted at several locations, including the Plant Genetic Resources Unit in Geneva, New York—usually referred to within the text as the Geneva orchard. The author suggests the orchard is better conceived as a museum of living apple trees. There, thousands of apple trees grow, with examples of virtually every known cultivar available. A fairly recent addition to the orchard consists of hundreds of *M. sieversii* trees, raised from seed gathered in Kazakhstan. The orchard hopes to preserve and study the apple's genetic diversity and makes a variety of seeds and scions available to the public. The text presents Phil Forsline as the curator of the Geneva orchard. Forsline is a scientist with interest in apple genetics and cultivation and provides much of the technical information presented in the text. In the late 1990s, Forsline and others traveled to Kazakhstan to investigate the conditions there. They discovered an astounding variety of apple trees scattered across a wide geographical area. Unfortunately, many of the denser areas were threatened by human development. Feeling that preservation of genetic variability was critical to the apple's future, Forsline collected a large amount of seed. He gathered additional seed on subsequent trips, and today an understanding of wild apple genetics is gradually being developed. The text suggests apple genetics and research is economically important but does not develop the topic. The chapter does not present much information about the apple's native range or typical pollinators or habitat. The chapter does not present a formal discussion of evolution, co-evolution or natural selection, though a basic understanding of these topics is vital to understanding the text's general thesis. Note that a better discussion of these topics is presented rather tardily in Chapter 2. Throughout the chapter, apples and apple trees are lightly but routinely anthropomorphized.



Chapter 2

Chapter 2 Summary and Analysis

Chapter 2, presents a scattered monograph regarding the tulip, or flower of a variety of about 100 species in genus *Tulipa*. At 52 pages, it is the shortest chapter in the text. Chapter 2 is also the chapter most tightly-focused around a dominant object—the tulip. Topics considered include the European introduction of the tulip, the 1636 - 1637, tulipomania craze of Holland, tulip color and anatomy and tulip culture trends in modern America. The history presented does not consider any single person as being dominant in the history of the tulip, and the material is presented in a fairly chronological fashion. Thus, the chapter reads as a general history of the tulip in Western floral gardening, and the tone is somewhat dry, though the material is interesting. The material presented is drawn from published sources and personal observation but lacks the intimate personal feel and texture found in the preceding and subsequent chapters. Even so, materials and theories presented as scientific are not rigorously defined, meticulously developed or even well-supported. In fact, several statements are mildly contradictory—for example, the chapter concludes that flowers owe much of their horticultural success to humans deriving "sustenance of their fruit and seeds" (p. 109) after flatly stating that the tulip has no nutritional or medicinal value.

The tulip is presented as strongly appealing to humanity's desire for beauty. The concept of beauty and its biological roots, is not adequately defined in the text to support the basic thesis of tulip-human co-evolution. The argument is further weakened by the descriptions of various types of tulips, which were found beautiful over the past few hundred years, yet standards for beauty have changed markedly. Ironically, the author states that tulips do not fit closely his particular ideal of beauty; he finds them rather pedestrian. The chapter does present a tardy summarization of evolution by means of natural selection, which is essentially correct in substance. It fails, though, to distinguish adequately natural selection from artificial selection, claiming that to the tulip the two means of selection are indistinguishable. This is contradicted mildly by latter materials pointing out that, for example, selecting tulips for beauty often makes for less healthy—hence less fit—plants. The chapter is also incorrect in treating a genus (*Tulipa*) as the fundamental unit of evolution. Much of the writing seeks to intertwine the notion of beauty with sexual behavior; while this is, perhaps, intuitive, it is not rigorously developed beyond suggesting that while honeybees are feeding, tulips are having sex. A close examination quickly reveals that though the language used is erotic, tulip sex is not.

The author argues that most flowers are essentially feminine, fitting the conceptualization of the Greek God Dionysus (the feminization of Dionysus is discussed in adequate detail). The tulip, however, is an essentially masculine flower, fitting the conceptualization of the Greek God Apollo. The rationale for using a dichotomy constructed on the framework of Greek mythology is not readily evident, though in construction, the alignment is well executed. The tulip is presented as a phallic object—



the bulb is said to be testiculate; the stem said to mimic the shaft of an erect penis, and the flower said to mimic a tumescent glans penis. A sprouting tulip is compared to the act of a human male obtaining an erection. Given this comparison, the author's minute inspection of a Queen of Night tulip, including sniffing, delicate fondling and close observation throughout an afternoon, has a vaguely homoerotic tone.

The chapter presents a fairly complete, if simplified, history of the modern distribution of tulips. Tulips originated in the region surrounding Constantinople, where they were viewed as a largely uninteresting local flower. In circa 1554, a few dozen tulip bulbs were transported from Turkey to Europe by Ogier Ghislain de Busbecq. Most of the bulbs ended up in the hands of Carolus Clusius, who raised them in his Leiden, Holland, gardens. Clusius refused to sell his bulbs, but they were subsequently stolen. Over the next few decades, descendants of these bulbs—mostly obtained from bulb-cluster, or offsets, division and replanting—appeared throughout Holland. Beginning in the early 1600s, a mania for tulips developed in Holland and bulbs of desirable types began to command incredible prices. As the economic bubble of tulips enlarged, speculators began to dominate the market. Stylized bidding processes were adopted and eventually promissory notes, presumably backed by actual bulbs, began to circulate in the financial frenzy. By 1636, tulip bulbs were bringing princely sums and the entire country was gripped in the frenzy known as tulipomania. On a single day in 1637, Holland lost its compelling desire for tulips and the market crashes, largely taking the Dutch economy with it. The period did, however, result in great advances in tulip culture and a number of new and beautiful tulip cultivars. Ironically, throughout the early 1700s, the Turkish demand for tulips far outstripped local endemic supplies and caused widespread importing of the native flower from Holland. This Turkish craze, too, became extreme and ended in the exhausting of the national treasury. It did, however, establish Holland as the preeminent locale for tulip—indeed all flowering bulbs—production. The recounting of tulip breeding history is a compelling aspect of the chapter and forms some of the most interesting reading in the entire book, but it does little to support the basic theses of the text.

The genus *Tulipa* is composed of about 100 recognized species; the text treats these many species as a single evolutionary unit and simply states that the group has enormous genetic diversity, which can be exploited by breeders. A discussion of this salient fact is not presented, and the casual reader is left to assume that all tulips come from more-or-less a single species, which demonstrates a unique gift for variability. Within the basic framework of a tulip flower, much variety of course can be seen. Tulips come in many colors, sizes, bud shapes and petal shapes. Most tulips exhibit a dual pigment layer, which, when combined, gives the flower its visual color. Tulips are often infected with a virus known as tulip breaking potyvirus. The virus causes chromosomal damage to the tulip and eventually weakens and kills an infected plant. However, the chromosomal damage includes damage to genes, which produce color in one of the two pigment layers and results in variegated, feathered patterns, which are generally thought of as fantastically beautiful. The virus is transmitted by the *Myzus persicae* aphid, and infected tulips are referred to as "broken tulips" or as having "color breaks." The Dutch tulipomania craze focused nearly entirely on broken tulips. Today, most



breeders eliminate color breaking tulips from their nursery because the virus weakens stock.

The chapter presents the author's childhood experiences with tulips, which consisted of planting them for a reward and then being wholly uninterested in them or any other flower. This introduction segues into a consideration of the role of flowers in general society and human history. The author notes that nearly all peoples in all places have cultivated flowers, with the peculiar exception of African peoples, who have taken to flower cultivation only recently and only partially. The text argues that flowers are cultivated for beauty as well as for occasional other benefits such as accompanying fruits or seeds. As the tulip has no known nutritional ingredient, flavor or medicinal qualities, it is an appropriate choice for a consideration of beauty stripped of utility. One of the stronger aspects of the chapter is the extensive discussion of tulip anatomy. Although this discussion is interspersed with other topics in the chapter, a fairly complete presentation of tulip anatomy emerges. Tulips are perennial plants, growing from bulbs. They usually produce a single stalk with a single flower. The flower usually sports six petals arranged in a consistent way around the pistil and stamens, with three petals forming an inner layer and three overlapping petals forming an outer layer. As the flower ages, the petals detach in a short period of time. The stalk is usually vertical but often bows. Petals are vividly colored and in most modern varieties are usually monochromatic. Tulip colors are derived from a dual pigment layer, where each layer sports a different color. On several occasions within the text, tulips are lightly anthropomorphized. The chapter does not present solid information about the tulip's full native range, typical pollinators beyond honeybees or habitat. Although gardening and cultivation techniques are mentioned, they are not discussed in sufficient detail to allow the text to be considered of practical use in gardening—even though the text often is classified as such a resource.

Chapter 3

Chapter 3 Summary and Analysis

Chapter 3 presents a rambling monograph regarding marijuana, plant material derived from the two species *Cannabis sativa* and *C. indica* and, in modern times, from hybrids of the two (e.g., *C. sativa* X *C. indica*). At 70 pages, it is the longest chapter in the text. The material is presented from a highly-subjective viewpoint, and the numerous topics are poorly developed and jumbled together. In effect, the texture of the chapter apparently seeks to mimic the confused stream-of-consciousness caused by marijuana intoxication. Word use in the chapter is atypical for the book—words such as "magic," "mad," and "shamanistic" link the discussion to subculture methods of expression. Topics considered include the natural history of marijuana, the American marijuana culture with a focus on the Pacific Northwest, contemporary marijuana culture, a lengthy, but scattered, discussion of the effects of marijuana intoxication, the effects of general psychoactive drug use, a theoretical model for understanding human consciousness, and the American criminalization of marijuana. The tone is informal and subjective, and the author is a proponent of marijuana use and decries its criminalization.

The book suggests that marijuana has replaced the apple as society's "forbidden fruit." Much of the chapter's material consists of repetitive statements about the putative and many benefits of marijuana, statements that are familiar in similar literature—yet, even so, the material is accessible, engaging and enjoyable. Marijuana is anthropomorphized, and marijuana intoxication is assumed to be a familiar situation with the reader—that is, the author assumes the reader has used marijuana. An example of this underlying assumption can be found in the narrative construction, which, for example, includes the text: "You know how it goes...You've heard that song a thousand times before, but now you suddenly hear it in all its soul-piercing beauty" (p. 166). The author states he has grown and used marijuana on various occasions, having once traveled to Amsterdam to sample local marijuana. Nearly all the material presented is derived from personal experience and observation, or personal interaction with cited experts, giving the text a personal tone. Marijuana is linked to other psychoactive drugs, including hashish, but the relationship between marijuana and hashish is not examined. The chapter reads as an intimate memoir and is nearly devoid of rigorous science beyond rampant speculation about the nature of human consciousness. Materials and theories which are presented as scientific are not rigorously defined, meticulously developed or even well-supported.

C. indica is stated to have originated in Central Asia, though the particulars are not given. *C. sativa* is inferred to have originated in Central America. The first established geographic region mentioned in the text as having been deliberately cultivated with marijuana is Mexico, where the crop grown was usually *M. sativa* and generally was intended for export to the North American illegal market. The first hybridizations of *C. sativa* X *C. indica* are said to have originated in the Pacific Northwest. The text asserts



that most marijuana in America was *C. sativa* of Mexican origin until the mid 1970s, when Mexico began spraying marijuana crops with the herbicide paraquat. Within years, most marijuana production had shifted to small-scale, local cultivations along the Pacific Northwest. *C. sativa* proved delicate to cold and was initially replaced by *C. indica* cultivation. However, most marijuana users subjectively prefer the "high" provided by *C. sativa*, and this preference led to the widespread hybridization of *C. sativa* X *C. indica*. The resulting hybrid demonstrated vigorous growth, climactic tolerance and a pleasant "high." Unless otherwise specified, all references to marijuana in the text presumably refer to the hybrid. At the same time that hybrid marijuana was being developed, cultivation techniques were being developed to allow indoor marijuana cultivation in very limited spaces. The transition for typical outdoor cultivation to highly-adapted indoor cultivation was spurred onward in the early 1980s, by America's massive "war on drugs," which further criminalized the already-illegal plant. By the mid 1980s, indoor cultivation techniques were highly advanced and highly successful. But faced with ever mounting pressure from law enforcement, most marijuana cultivation left America for Amsterdam and its environs. There, marijuana cultivation, though illegal, is officially tolerated to some extent, and marijuana use is openly tolerated. The text thus demonstrates that human impact on marijuana evolution has been remarkable—particularly within the last four decades. However, the text offers little credible evidence supporting the book's main thesis that marijuana has exerted a similar influence on human evolution during roughly the same period.

When smoked or ingested, marijuana leads to an intoxicating effect colloquially known as a "high." The text asserts that science has no credible explanation for marijuana's subjective effect aside from terming it cognitive dysfunction. This is contradicted by a lengthy pseudo-scientific discussion of brain function and the elucidation of brain locales containing numerous so-called "cannabinoid receptors" (p. 153), or molecules which bond to tetrahydrocannabinol, or THC—thought to be the primary psychoactive component in marijuana. Much of the chapter is given over to a subjective and unstructured examination of the nature of being "high," including the assertion that being "high" on *C. sativa* is much preferable to being "high" on *C. indica*. The idea that the brain has receptors apparently expressly designed only to receive a chemical message from a plant originating in Central Asia poses unique problems, which are not well addressed. The text also suggests that the marijuana plant produces THC for the express purpose of getting humans "high," which is an untenable assertion for a book which purportedly discusses co-evolutionary trends—the view would not be out of place, of course, in a mystical apology of marijuana. The chapter briefly considers non-human intoxication from plants, using domestic cats and cat nip as the chief example. This material is briefly presented in a straightforward manner and the existence of the chemical interaction is presumed to be merely a curious biological accident. It is unclear why such straightforward thinking is not applied to marijuana. In any event, the mystical or shamanistic approach to the "reason" for marijuana's existence detracts from the discussion's credibility in a major way.

Returning to a recurrent theme in the novel, marijuana is said to be a Dionysian plant as it causes intoxication. The cultivation of marijuana, oddly, has become a very Apollonian endeavor. The book offers two interpretations of the evils of marijuana. In the first,



marijuana intoxication is said to sever one's link to conscience and thereby spur users toward acts of violence. This belief, refuted by marijuana users, has its roots in the Oriental tales of Hassan ibn al Sabbah and his hashish Assassins. The second evil use of marijuana is as an inverted and wicked substitute for the Christian sacrament—a long-held belief of e.g. the Catholic Church. Marijuana causes users to look to the earth instead of heaven, robbing them of salvation. These charges are fairly easy to dismiss and the narrative does so successfully. The author then theorizes that occasional marijuana intoxication is a useful and good practice, which should be allowed and even encouraged. The chapter asserts that marijuana's pervasive influence on humanity stems from the human desire for intoxication.



Chapter 4

Chapter 4 Summary and Analysis

Chapter 4 presents a scattered monograph regarding the potato, or tuber derived from *Solanum tuberosum*. At 57 pages, the chapter is of average length, and portions of the chapter were previously published in a 1998, edition of *The New York Times Magazine*. The chapter uses the phrase potato, nearly interchangeably, to refer to the plant itself and to refer to the edible tuber. The material is presented in a fairly objective style, and the chapter is the best-developed and well-presented chapter in the text. Topics considered include the Andean origin of potato culture, early European cultivation, Irish cultivation, the Irish potato famine, modern American monoculture cultivation and the implications of the Monsanto Corporation's genetically engineered NewLeaf potato cultivar. The tone is more formal and far more objective than the remainder of the book; the potato plant is presented objectively and does not suffer from the anthropomorphizing of subjects common in the previous chapters. Several genetics and biological topics are presented in substantive detail—material that arguably should have been presented earlier in the text. The chapter presents the author's personal experiences growing, cultivating, preparing and eating potatoes. The chapter also presents a fair amount of material derived from interviews with various potato experts. Most materials presented as scientific are supported by an acceptably-thorough discussion. For example, Gene Flow is discussed and well-supported with a good blend of example and theory.

Potato cultivation originated in the Andean region of South America among the ancestors of the Incan peoples. Andean cultivation presents unique challenges due to variegated conditions in local areas because of rapid elevation changes and deep folding of near-vertical ascents. Early potato cultivators responded by allowing the single species to thrive as multiple cultivars across a single agricultural unit. Thus, an early Andean potato farmer would raise dozens of varieties of potatoes in his small farming area, each variety well-suited to the particular plot of land in which it grew. The resulting potato harvest included dozens of distinct potato types, varying in color, size, shape, texture and taste. The text reasons that, to the Andean farmer subsisting nearly entirely on potatoes, such variety was probably very desirable. The author considers several varieties of potatoes, including some that are blue or orange, and some that are atypically shaped—at least, shaped differently from what a modern American would consider normal for a potato.

The potato was exported from South America to Europe throughout the seventeenth century, though it was received with indifference. The major European powers—England, France and Germany—found little to recommend the potato and retained a great dependence upon grains such as wheat and corn. The potato was thus largely ignored throughout Europe, except in Ireland. There, political conditions ensured that most native peoples survived on a subsistence level and worked tiny plots of land under nearly untenable conditions. The potato was discovered to be an ideal foodstuff for



cultivation under Irish conditions. Taking almost no effort for cultivation, the potato thrived in the Irish soil and geography and formed the staple food for a rapidly expanding population. As the potato had no export value, it was not a commodity and therefore remained in local control. As the potato can remain in the ground until needed, stockpiles of harvested foodstuffs were not available for seizure leading to political control. As the potato emerged as the dominant food for local peoples in Ireland, so its image in Europe as a food for the poor and uneducated spread. Irish cultivation focused on local varieties and quickly settled on the nearly universal monoculture of the Irish Lumper. The constantly-available potato, combined with other geopolitical forces, led to a population explosion in Ireland that persisted until 1845.

In 1845, potato crops in Ireland and around the world were devastated by a pathogenic mold, *Phytophthora infestans*, commonly known as potato blight. The mold reproduced explosively, was highly infectious and was carried on wind currents. It quickly spread throughout Ireland, killing infected fields in as little as a few days. Potatoes in the ground were turned to slime and even stockpiled stores were infected and destroyed. Although the mold infected potato crops in Europe, its impact was confined largely to Ireland. There, an estimated one quarter of the population died of starvation or emigrated, largely to the United States of America. The horrors of famine were compounded by a tyrannical, absentee government that continued to ship what food there was out of the country to foreign markets. Successive years saw additional crop failures due to potato blight. Eventually, new cultivars were imported and the potato famine—the greatest calamity to befall Europe since the plague—passed. The text suggests that Irish monoculture and the resultant famine should serve as a warning to modern American potato monoculture. The gradual adoption of potatoes throughout continental Europe is briefly considered. In France, adoption was fostered by Royal stratagem. A reticent public refused the potato until the King planted potato fields and placed them under heavy guard. He allowed the guards to go home during the night, however. The perception that potatoes were so valuable as to necessitate guards caused constant evening thefts and the gradual, but steady, spread of the potato throughout France.

Potato cultivation provides a major crop for many American farmers, especially in the Idaho region. Nearly all potato farmers raise the monoculture Russet Burbank, which largely is used to make French fries. The monoculture is well suited to making beautiful, golden French fries—but is not very disease resistant, not very pest resistant and not very fungus resistant. As a result, potato farming generally is very chemical dependent. The text summarizes a typical potato growing regimen as consisting of: pre-crop application of antibiotic; pre-crop application of herbicide, either Lexan, Sencor or Eptam; and pre-crop application of insecticide—usually Thimet; followed by planting in what is then called a "clean" (p. 218) field—clean of all prior life. A few days after planting, a second insecticide application is made. This is followed by periodic watering with a water-diluted mixture of pesticide and fertilizer. An additional ten applications of fertilizer are performed each week throughout the growing season. A fungicide—usually Bravo—is applied every fourteen days throughout the growing season. A mid-season aphid spray called Monitor is also applied; Monitor is so toxic that farmers do not enter their fields for about a week after application. This results in a crop which averages



\$2,000 per acre at market, but costs about \$1,950 per acre to produce. The resultant potatoes generally are not eaten until they have been stored for a few weeks to "detoxify." At least one interviewed potato farmer refuses to eat potatoes produced by his own farming methods; instead, he eats potatoes grown in the family plot, without chemicals.

Another farming method is presented, which results in an "organic" (p. 225) crop. In organic potato farming, a variety of cultivars are grown in a patchwork—Russet Burbanks are excluded. Insects are not eliminated from the fields and weeds are common. These farming methods are labor intensive and serve a limited market but are feasible. Additionally, the organic potato farmer interviewed does not hesitate to consume his own harvest. However, most of the organic crop produced is sent to overseas markets. The author then suggests that the modern America monoculture in potato farming is much similar to the Irish monoculture, which led to the Irish Potato Famine; America may well be on the brink of collapse in its agricultural methods.

One of the dominant pests plaguing potato culture—especially Russet Burbank monoculture—is the Colorado potato beetle. The beetle eats the leaves of potato plants and will strip a plant of leaves, killing it, in short order if left alone. Many of the insecticide spraying done in "clean field" farming are directly targeted at the Colorado potato beetle. Many of the labor-intensive components of organic potato farming are designed to curb the damage caused by Colorado potato beetles. One technique for controlling the pest is to spray potato crops with a soup of *Bacillus thuringiensis*, a bacteria isolated from soil and grown in industrial production units. The bacteria produce a toxin, which, when ingested, rapidly kills Colorado potato beetles. Producing and applying the spray is costly, however. The Monsanto Corporation has developed a potato plant, patented as the NewLeaf, which is a transgenic organism. The NewLeaf has the basic biology of a potato plant but also carries the Bt gene—isolated from the bacteria—which produces the toxin that kills the Colorado potato beetle. Thus, every cell in the plant—and every cell in every potato—produces a chemical toxic to the Colorado potato beetle and putatively harmless to humans. NewLeaf potato plants are never bothered by Colorado potato beetles, though they are susceptible to various other potato pathogens. The author receives and cultivates NewLeaf potatoes in his garden, though at harvest time doubts about their safety as food prevent him from eating them.

Trials of NewLeaf have indicated it successfully self-defends against Colorado potato beetle infestation. Market trials indicate that informed Americans will rigorously avoid consuming NewLeaf potatoes, however. Nevertheless, special labeling is not required by the Federal government. The McDonald's Corporation originally purchased NewLeaf potatoes indiscriminately but has stopped carrying the food item due to consumer demands. NewLeaf potatoes have enjoyed some successes, but, in general, acceptance has been spotty. Many scientists believe that widespread cultivation of NewLeaf would lead to the Colorado potato beetle developing resistance to the Bt-produced toxin; Monsanto agrees and feels such resistance is perhaps 30 years away. Much of the chapter considers the ethics of transgenic crop foods, but the author does not present any systematic viewpoint or thorough arguments either for or against; instead, he relies upon his own subjective feelings and urges readers to do the same.



The author does note that NewLeaf potatoes are considered to be a pesticide—and not a food—by the Federal government. Further, licensing agreements are in place for those desiring to cultivate the patented NewLeaf plant. Various opinions about NewLeaf are offered in the text. The author suggests that the NewLeaf potato represents a sea-change in agriculture and should be viewed as a momentous step in the history of agricultural evolution. The chapter asserts that the potato's pervasive influence on humanity stems from the human desire for control; the author suggests that Monsanto's transgenic NewLeaf demonstrates humanity's hubris and the desire to control life, and also suggests that the history of potato cultivation in Europe demonstrates political control through agriculture. However, the linkage of potato to control is a fairly weak association and does not carry through with the same convincing development seen in previous chapters.



Characters

Michael Pollan

Michael Pollan is the author of the text and has written other books and numerous articles. Pollan is a recognized authority in environmental journalism and has won several prestigious awards. Pollan occasionally works as a public speaker. The text offers virtually no autobiographical information and the blurb on the sleeve is quite concise. Pollan is obviously an avid gardener, growing flowers such as the tulip; vegetables, including many types of potatoes, and fruits such as apples. He admits to having grown marijuana and poppies and has used marijuana on numerous occasions. The most personal aspect presented in the text is Pollan's admission to being squeamishly unable to ingest NewLeaf potatoes after raising a bumper crop of them in his personal garden. Pollan's writing style is professional, accessible and quite engaging. In fact, the most appealing aspect of the text is the presentation and capable phrasing, which far exceeds the materials actually presented. His vocabulary is impressive and his ability to turn a phrase is remarkable. Additionally, there is no doubt that he is a competent and devoted gardener and confirmed naturalist.

John Chapman (Johnny Appleseed)

John Chapman (1774-1847) was an American pioneer and legendary proponent of the apple tree and introduced the species to several locations in Ohio, Indiana and Illinois. A legend in his own time, Chapman was reportedly generous and kind and used his position to promote conservation. His history is now shrouded in legend, but Chapman is generally acknowledged as having planted at least tens of thousands of apple seeds across a wide range of orchards. Additionally, he was an active missionary for the Swedenborgian Christian movement. The text presents Chapman as a highly eccentric man—nearly a crank—with a single-mindedness bordering on mania. Chapman held no romantic inclinations, was apparently devoid of sexual desire, felt that using animals for labor or convenience was wrong and apparently believed that grafting apple cultivars perverted nature's grand design. He preferred life outdoors to life indoors and reportedly often lived in logs, caves or hollow stumps in preference to a more-typical dwelling. Even so, Chapman was wealthy and possessed extensive land holdings. He traditionally went barefoot, wore a tin pot as a hat and dressed in a sort of burlap overcoat tied at the waist.

As apple varieties do not grow true from seeds, the extensive orchards planted by Chapman consisted of a variety of "wild" apple trees, most of which would not have been suitable for consumption. The author argues that Chapman's easy successes at planting, promoting and selling apples was rather due to the frontier tradition of converting apples into so-called "hard" cider. In other words, the vast majority of Chapman's trees were used to grow apples for fermentation. His apple trees realized about six and one-half cents, when sold for transplantation. He seems to have had an



uncanny knack for knowing which regions would soon be colonized by the grand westward movement and hence spent most of his adult life on the frontier. He apparently moved between white and Indian civilization with equal facility. Chapman possessed nearly inhuman health and is often depicted as unusually thin and long-limbed. Much of Chapter 1 of the text is devoted to a depiction of Chapman as either a historic individual, a legendary figure or an admixture of both. In any event, Chapman's wide seed planting led to a vast increase in the apple's range and ultimately resulted in several cultivars well-adapted to the American habitat. The author presents Chapman as an American Dionysus.

William (Bill) Ellery Jones

William Ellery Jones, fifty-one years old at the time of the book's publication, is presented as Ohio's leading authority on Johnny Appleseed. By profession, Jones is a fund-raising consultant, but by passion he is an Appleseed historian. During the time period considered in the book (roughly 2000 CE), Jones is raising money to establish a Johnny Appleseed Heritage Center and Outdoor Theater near Mansfield, Ohio. Jones is presented as a consummate Appleseed enthusiast, but the author finds most of Jones' purportedly historical information to be over-enthusiastic and suspect. During Chapter 1, the author spends several hours in Jones' company as they visit numerous sites important in Appleseed history and discuss the man and the legend at considerable length. In general, any story critical of Appleseed's actions or intentions is dismissed by Jones as fallacious, while any story promoting Appleseed's generosity or larger-than-life person is credited by Jones as fully authenticated. The author attends one of Jones' lectures and dismisses the content as "pap" (p. 31) presented for a modern, urban sensibility. Given the author's nearly hostile presentation of Jones, it is peculiar that Jones figures in such a personal and prominent way in Chapter 1. Jones receives a personal mention in the Sources of the text and is the editor of *Johnny Appleseed: A Voice in the Wilderness*, an anthology of historical writings on John Chapman.

Phil Forsline

Phil Forsline is, in the text, referred to as the curator of the Geneva Orchard, a sort of museum of apple tree varieties. Forsline is presented in the latter portion of Chapter 1, as a sort of horticultural expert on apples and their propagation. In the late 1990s, Forsline and others became concerned with preserving the apple's genetic diversity. The original range of the apple tree is thought to be Kazakhstan, and some of the oldest apple forests are threatened by human development. For this reason, Forsline and others made several expeditions to Kazakhstan and harvested large amounts of native seeds. Very little biographical data about Forsline is offered, though the author obviously holds a high opinion of Forsline's scientific reasoning.



Ogier Ghislain de Busbecq, Carolus Clusius, and Sultan Ahmed

Ogier Ghislain de Busbecq (1520 - 1592), ambassador of the Austrian Hapsburgs to the court of Süleyman the Magnificent in Constantinople, is said to have originally introduced tulip bulbs from Turkey to Europe circa 1554. Because of this royal court-to-court transfer, the tulip was established as a royal flower. Much of the resultant European history of the tulip is recounted in the text, with a particular focus on the tulipomania in Holland, which reached a peak in 1636-1637.

Carolus Clusius (1526 - 1609) received many of the first tulips to arrive in Europe. A well-known botanist and flower enthusiast, Clusius planted tulips in his "physic" garden in 1593, at Leiden, Holland. Clusius was so possessive of his tulips that he refused to sell any, and then, one night, most of them were stolen. Clusius thereafter withdrew from tulip cultivation, though descendants of his stolen bulbs quickly spread throughout all of Holland.

Ironically, from 1703 to 1730, the Turkish demand for tulips far outstripped local endemic supplies and caused widespread importation of the native flower from Holland. Sultan Ahmed III (1673 - 1736) spent vast sums on tulips during the *lale devri*, or Tulip Era, bringing home native plants, beautifying his gardens and exhausting the national treasury. His extravagant gardens eventually also exhausted the public's patience and led to his dethronement. The text describes Sultan Ahmed III's evening tulip displays in some detail.

Dr. Adriaen Pauw

Adriaen Pauw (1581 - 1653) was a Dutch politician of vast wealth and considerable influence. He was engaged in international politics and was also a tulip connoisseur, who, through the 1620s, owned nearly all bulbs of the famed *Semper Augustus* tulip—the text states he owned either eleven or twelve bulbs—in any case, all but one. Pauw refused to sell any of his bulbs, preferring beauty to profit. His gardens were arranged to best display the beautiful flowers. Open to many guests, Pauw's arousing display of the *Semper Augustus* flowers helped spark the tulipomania craze. The text suggests that rather than Pauw owning the flowers, they in a way owned him. Little biographical data about Pauw is offered in the text.

Samuel Taylor Coleridge and Plato

Both men indicated are examples within the text of notoriously creative individuals thought to have routinely used psychoactive drugs. The text suggests that much of their creativity stemmed from such drug use—an unfortunate supposition that minimizes both men's astounding achievements. Samuel Taylor Coleridge (1772 - 1834) was an English poet and philosopher, who was one of the founders of the Romantic Movement in



England. His literary work is considered canonical. The text provides virtually no biographic data for Coleridge but, in Chapter 3, argues that his inspiration was undoubtedly due to psychoactive drug use.

Plato (c. 424 BC - c. 348 BC) was a classical Greek philosopher, who assisted in the foundation of the philosophical foundation of Western culture. The book contains virtually no biographical data on Plato but frequently refers to his basic philosophy stemming from the so-called allegory of the cave. In brief, Plato held that all physical objects are "shadows" of an idealized and perfect form, existing only to the extent that they instantiate the idealized form itself. Thus, physical objects are ephemeral and imperfect—fleeting phenomena. The text argues somewhat unconvincingly that modern agriculture's dependence upon monoculture is a realization of this aspect of Plato's philosophy. The text also argues, in Chapter 3, that Plato's inspiration undoubtedly came from psychoactive drug use.

Charles Darwin

Charles Darwin (1809 - 1882) was an English naturalist and scientific philosopher. The text provides virtually no biographical data on Darwin, but as a major theme utilizes scientific theories attributed, often incorrectly, to Darwin. Contrary to popular opinion, Darwin did not suggest evolution; he did, in fact, suggest natural selection as the motive force driving evolution. The text cursorily examines evolution, co-evolution, natural selection, artificial selection, sexual selection and gene drift—all theories generally associated with Darwinism.

Dave Starck, Glenda Debrecht, and Dave Hjelle

The three people indicated are employees of the Monsanto Corporation. Together, they offer Pollan a tour of the Monsanto biogenetics greenhouse complex near St. Louis, Missouri. Neither individual is described in any detail, and they are presented as nearly faceless individuals working for a huge corporation.

Dave Starck is described as "one of Monsanto's senior potato people" (p. 206) and takes Pollan on a guided tour of the Monsanto genetic engineering laboratories. Starck describes two methods of producing transgenic organisms—agrobacterium infection and the gene gun. Glenda Debrecht is a staff horticulturist for Monsanto. She plants and raises the transgenic potatoes produced in Monsanto's laboratories. Debrecht demonstrates the agricultural techniques used to raise new crops of Monsanto's genetically engineered potatoes. Dave Hjelle is Monsanto's director of regulatory affairs. He gives a lengthy interview to Pollan, where he insists that transgenic potatoes are entirely safe—an assertion which Pollan cannot quite believe. Hjelle also states that current American agricultural practices are unsustainable—a statement which Pollan finds entirely credible.



Danny Forsyth, Steve Young, and Mike Heath

The three named individuals are all Idaho potato farmers, and all three offer extensive interviews to Pollan. All three men are likable, credible and hard-working individuals. Two, Forsyth and Young, practice modern agribusiness farming—one, Heath, practices organic farming. Heath's farm yields nearly as many potatoes per acre as Forsyth's and Young's farms, but the potatoes are not the monoculture Russet Burbank, which American consumers demand.

Danny Forsyth is an Idaho potato farmer who practices the "clean field" method of production. Forsyth gives Pollan a tour of a potato farm and describes the process of potato agriculture in considerable detail. Forsyth is concerned that many of the chemicals used in potato farming are toxic and dangerous and confides in Pollan that he grows his personal potato crop in an entirely different way which does not use chemicals. Forsyth is probably the most-sympathetic individual presented in the book and is entirely credible.

Steve Young and his family are Idaho potato farmers, who own considerable holdings and practice fully modern "clean field" methodologies. Their farming practice is fully computerized and uses a great amount of technology. Young, a member of the Church of Jesus Christ of Latter-day Saints—or Mormons, invites Pollan to dinner and offers him potato salad made from freshly-dug potatoes, including NewLeaf patented potatoes. Pollan worries about eating chemical-laden potatoes as much as bioengineered potatoes. Young is a sympathetic and entirely credible individual who feels that modern agribusiness is a mixed blessing.

Mike Heath is an Idaho potato farmer, who raises an organic crop of mixed cultivars. His process is much more labor intensive than Forsyth's or Young's "clean field" methodology, but uses only a fraction of the pesticides, herbicides, fungicides and insecticides. Heath's success, however, is largely due to his long experience and education. Heath's organic product does not satisfy American business demands for a long, golden, French fry—but sells for twice as much in foreign markets. Heath brags that he can dig a potato out of the dirt and eat it immediately—not possible with many other chemically-laden potatoes, which require shelf time to detoxify.



Objects/Places

The Apple (*Malus domestica*)

The apple is the primary subject of Chapter 1 of the text. The apple is the fruit of the apple tree, or *Malus domestica*, which is one of the most widely-cultivated fruit trees in the world. The tree is small and deciduous, and comes from an original range in Kazakhstan. Apple trees do not breed true from seed, and thus nearly all modern domestic or garden apple trees are established by grafting material taken from well-known cultivars.

Red Delicious and Gold Delicious

The Red Delicious and Gold Delicious apples are two widely-recognized cultivars of *Malus domestica*. In the modern world, they are the two most-popular apples available. The Red Delicious was discovered by Jesse Hiatt in Peru, Iowa. Originally naming the variety Hawkeye, Hiatt entered the cultivar in a 1893, contest. The Hawkeye was the winning entry and the contest moderator, C. M. Stark, re-christened the variety the Delicious. Later, it was named the Red Delicious to distinguish it from the Golden Delicious. Today, the site of the original Red Delicious is marked by a granite monument.

The Golden Delicious was discovered on a hillside in Clay County, West Virginia. C.M. Stark's brother, Paul, purchased the tree in 1914, for the then-unheard of price of \$5,000; it was subsequently enclosed in a padlocked steel cage, and wired with a burglar alarm. The original Golden Delicious tree lived until the 1950's.

The Geneva Orchard

Modern apple research is conducted at several locations, including the Plant Genetic Resources Unit in Geneva, New York—usually referred to within the text as the Geneva orchard. The author suggests the orchard is better conceived as a museum of living apple trees. There, thousands of apple trees grow, with examples of virtually every known cultivar available. A fairly recent addition to the orchard consists of hundreds of *M. sieversii* trees, raised from seed gathered in Kazakhstan. The cultivators of the orchard hope to preserve and study the apple's genetic diversity and make a variety of seeds and scions available to the public.

The Tulip (*Tulipa*)

Tulips are plants of the genus *Tulipa*, which is comprised of about 100 species. From its original range in Turkey, the tulip was sent to Europe, where it enjoyed particular popularity in Holland throughout the 1600s. By the early 1700s, breeders in Holland had



created so many unique and beautiful cultivars that considerable sums were spent to bring cultivar bulbs back into Turkey. Tulips are the primary subject of Chapter 2 of the text.

Semper Augustus and Queen of Night

Semper Augustus was the name given to arguably the single most-famous tulip of all time. The Semper Augustus flower, borne only on about a dozen bulbs, was owned by Dr. Adriaen Pauw. Their beauty helped spark the tulipomania craze, which swept through Holland in the early 1620s. The now-long-gone Semper Augustus, often depicted in contemporary paintings, had carmine and white streaks on its color-breaking petals. The single Semper Augustus bulb sold brought 6,000 florins at auction—an average annual income at the time was about 150 florins.

The Queen of Night is a trade-name given to a modern tulip variety which is nearly black. In fact, the flower is very, very dark purple—though it appears black in most light. The author spends a considerable amount of time contemplating a Queen of Night bloom, comparing it to the negative space where a flower "should" be.

Myzus persicae, virus, and color breaks

M. persicae, or the peach potato aphid, commonly infests tulips and carries a virus from flower to flower. The virus, discovered in the 1920s, infects the tulip and disrupts color-forming genes causing color "breaks" in tulips: in other words, vivid streaks of color against an overall background of another color. Once considered highly desirable, color breaks are in general not desirable in modern tulips and hence the virus, along with the aphid that transmits it, is avoided. Tulips infected with the virus are less hardy and reproduce less and more slowly than uninfected tulips.

Tulipomania

Tulipomania is a phrase used to describe a tulip craze, which swept Holland in the early 1600s, culminating in 1636-1637. It is considered in the text as a type of popular delusion, explained by a theory offered as the "greater fool" theory—an intrinsically worthless item is worthy of purchase by a "fool" only insofar as a "greater fool" can subsequently be located to purchase it for even more money. Tulipomania reached its height when a single bulb of Semper Augustus sold for 6,000 florins at auction (an average annual income at the time was about 150 florins). The tulip market crashed nearly overnight in 1637. Today, tulipomania is regarded as another example of a large economic bubble, fueled by rampant speculation.



Marijuana

Marijuana is a plant of *Cannabis sativa*, *C. indica*, or a hybrid of the two (e.g., *C. sativa* X *C. indica*). The text alternately uses the word to refer to material derived from the plant, although the flowers of the plant are generally specified as *sinsemilla*. Chapter 3, describes the history, cultivation and use of marijuana, with a strong focus on American sub-cultural use of the plant as an illegal psychoactive drug. The book suggests that marijuana has replaced the apple as society's "forbidden fruit."

Sea of Green

The phrase Sea of Green is used in the text to describe the intensive modern marijuana cultivation technique, perfected in 1987, used around the world. Hybrid marijuana clones are grown in high density plots using high-intensity metal halide lighting and other artificial environmental manipulations—all described in the text. A Sea of Green the size of an average pool table will yield three pounds of *sinsemilla* in two months' time. The *sinsemilla* will have a THC content of about 20% and have a wholesale street value of, at the time of publication, about US \$13,000.

The Potato (*Solanum tuberosum*)

The potato, or *Solanum tuberosum*, is a small-bodied tuberous plant, originally occurring in the Andean region of South America, where it has always been a critical component of agriculture. The potato was exported to Europe, where it found great agricultural use in Ireland, being nearly uniquely suited to conditions there. The potato was re-imported to the Americas during the massed westward migration of European peoples. The potato is the primary topic of Chapter 4.

NewLeaf

NewLeaf is the trade name for a patented potato owned by the Monsanto Corporation. The potato is a transgenic organism; every cell in the plant contains a "Tb" gene derived from the bacterium *Bacillus thuringiensis*. The gene causes the cells of the plant to produce a protein, which is highly toxic to the Colorado Potato Beetle. Potato farmers growing NewLeaf potatoes do not need to use as many pesticides during crop development. On the other hand, NewLeaf potatoes contain detectable amounts of the toxic protein—thought to be harmless for humans.



Themes

Humans Manipulate Plants

The book conclusively demonstrates that humans have manipulated plants through agriculture and cultivation throughout recorded history. All the plants mentioned are economically significant plants that have been extensively cultivated for prolonged periods of time. Most of the book, in fact, demonstrates and illustrates how extensive humans' influence over individual plant groups has been. The apple has been domesticated—in fact is named *Malus domestica*—for thousands of years and its natural range has been vastly expanded by human activity. The book discusses John Chapman's activity as an extreme example of how far the apple's range can be extended by vigorous cultivation. Much of modern agriculture's techniques have been developed for the purpose of further domesticating species such as apples. Thus, individual apple cultivars are discovered and artificially selected and propagated through grafting. The tulip genus has likewise been extensively and artificially selected, and its range has been vastly expanded by gardeners and businessmen. Marijuana cultivation provides perhaps the most-extreme example of human impact on plant evolution presented in the text. Within a period of about twenty years, a hybrid cultivar of marijuana spread around the globe and was so intensively selected that its desirable trait—THC content—was magnified by an order of magnitude. Thus, a fibrous weed from central Asia has come to dominate illicit basement agriculture throughout the world. Finally, the potato's meteoric rise in range from marginal Andean habitat to global cultivation is obviously entirely due to humankind's manipulation. Indeed, the text is so replete with examples of humanity's impact on various plants that this is the dominant—though unintended—theme of the book.

Plants Manipulate Humans

The text's reported major theme is the manipulation of human evolution by various plants. The book suggests that its major theme is "coevolution" (p. xiv) of *Homo sapiens* and selected organisms. Unfortunately, the book fails to support this central thesis. Evolution is not defined; coevolution is only weakly defined, and examples of plant-caused evolution within *H. sapiens* are not presented. Perhaps this lack of a general underpinning of terminology is the book's primary failure. The book weakly links coevolution to "a complex reciprocal relationship between the human and the natural world" (p. xvi), but co-evolution would be only one facet of such a complex relationship, and a rigorously-defined facet at that. Perhaps a better term for use within the text would have been mutualism, a form of symbiosis. That humans enjoy a rich and complicated relationship with various plants is undoubtedly true—yet this is not coevolution. Humans cultivate apple orchards, tulip gardens, marijuana plants and potato fields throughout the year and around the world. Vast effort and huge sums of money are invested in the culture of these crops. Undoubtedly, the plants are selected to suit human needs, and undoubtedly humans benefit greatly from the plants. Yet the book



fails to establish that humans have evolved in response to marijuana's intoxicating effect, fails to demonstrate that humans have evolved in response to the apple's sweetness or the tulip's beauty and fails to even strongly link human evolutionary pressure to the control of the potato as a crop plant. The book does strongly support, however, the notion that human behavior has been modified greatly in the pursuit of the apple's sweetness, the tulip's beauty, marijuana's intoxication and the potato's nutrition. And such a complex reciprocal relationship between the human and the natural world, indeed, forms a major, and enjoyable, theme of the text.

The Philosophy of Gardening

The publisher—and therefore presumably the author—categorizes the text as a Nature/Gardening book. This is accurate, but the text is unfortunately commonly viewed as a sort of primer on the science of evolution with an emphasis on co-evolutionary trends. The text does little to dispel such notions, using much scientific jargon, reporting various scientific findings, appealing to science often and even reporting various statistics. All this lends the text a general tone of "scientific" reporting. Unfortunately, the book does a fairly poor job of explaining evolution, co-evolution and natural selection. Artificial selection and gene flow, topics which receive better development, are accurately presented but are not central to the text's development. Instead, the real strength and obvious appeal of the text lies in its intimate tone and its presentation as a personal memoir. The author has gardened extensively, has grown a variety of crops, flowers and drug plants and has spent a great deal of time thinking about the natural world and the microcosm of the garden. The author displays a remarkable facility to present a variety of information about a topic in an engaging and enjoyable manner. The book reads well as a primer on the philosophy of gardening. While the book might not explain how marijuana drives human brain evolution, it does explain why humans grow marijuana, how humans present tulips, how humans propagate apples and how humans enjoy potatoes. It does explain why we grow the types of apples we grow, why we grow tulips of certain types, why marijuana use probably will never be curbed and why we hesitate to eat a genetically-engineered potato. Yet the book is not a gardening text. There is relatively no information about how to select an appropriate cultivar, no information about how actually to plant a tulip and insufficient information actually to grow a THC-rich plot of marijuana. What hands-on "how-to" that is provided usually appears as explanation for why things are as they are. For example, the explanation of how marijuana is cultivated in limited spaces using advanced techniques and artificial environments is proffered because of legal implications of growing marijuana out-of-doors. Although the book is short on gardening how-to, it is rich with the philosophy of growing and human-plant relationships.

Style

Perspective

The book is presented from a first-person, intimate perspective. The author frequently reports first-hand experience and opinion, commonly using construction such as "I think I understand Huxley's reducing valve of consciousness" (p. 169). The text is, therefore, remarkably personal and intimate. This first-person presence is carried to its logical conclusion in Chapter 4, where the author presents a chronologically dated series of paragraphs that read almost like a diary—in the entries, the author describes the process of planting, cultivating, harvesting and eating potatoes from his personal garden. The perspective used is engaging, accessible and enjoyable—in many ways, the most enjoyable aspect of the text.

The author's experience within the selected topic is extensive. He relates personal experience with virtually all aspects of cultivation covered by the text. When processes outside of the author's direct experience are discussed, they are supported by statements or experiences of experts. Thus, the author travels to ancient orchards planted by Johnny Appleseed, smokes marijuana in Amsterdam and travels to potato farms in Idaho to gather information for the book. Not only this, but the author seeks out experts to corroborate his personal experience and opinions. Thus, the author interviews experts on Johnny Appleseed and marijuana cultivation, and personnel involved in the production of genetically-engineered seed potatoes. This all yields such a rich perspective that the resulting personal opinion offered is, given its underpinnings, basically sound.

Tone

The text is presented in a personal style akin to standard journalistic English. Events generally are presented in an unemotional and professional manner, which allows a great deal of confidence to be placed in the narrative structure. The narrative contains a large amount of subdued, but insightful, humor and, in general, is extremely enjoyable and imminently accessible. The book is written, structured and presented as a statement of personal involvement in and perception of the cultivation of various types of plants, including apples, tulips, marijuana and potatoes. Topics considered in the book are global in scale, although they unmistakably bear a view focused on the United States of America. The author is aware of the historic nature of the over-arching developments described in the book and therefore usually presents his own infrequent personal bias and feelings as such.

The text is related in the first-person point of view and therefore is subjective; Pollan relates the text on his own terms, giving it the feel of a memoir. As such, items of importance in his personal opinion are given extensive treatment in the text. Pollan does provide some objective information about individuals or particular events but also



usually provides his subjective interpretation alongside. The book is simultaneously personal and informative. While the text has notable failings in the area of evolutionary science, it more than compensates by presenting an enjoyable and engaging read, rich in philosophy and insight.

Structure

The 271-page text is divided into four chapters, additionally including an introduction, an epilogue, a complete list of sources and a comprehensive index. The introduction and epilogue attempt to frame the four chapters into an overarching discussion of co-evolution and additionally provide some basic conceptualization of evolutionary science. Largely ineffective, the introduction and epilogue nevertheless introduce the texts' dominant themes. The section on sources is informative and well-developed. As the text develops topics in a fragmentary way, especially during Chapter 3, the comprehensive index is quite valuable.

Each of the four chapters is devoted to a single item; either a species, as in Chapter 4; a genus, as in Chapter 2; or a few species and their hybrids, as in Chapters 1 and 3. Chapter 1, considers the apple, a fruit appealing to humanity's yearning for sweetness. Chapter 2, considers the tulip, a flower appealing to humanity's yearning for beauty. Chapter 3, considers marijuana, a weed appealing to humanity's putative yearning for intoxication. Chapter 4, considers the potato, a tuber appealing to humanity's desire for control. All of the chapters include a basic discussion of the subject organism's origin, spread to global cultivation and modern-day importance. The text is heavily focused on modern American cultivation of the subject organisms. The book is well-balanced, well-written and very enjoyable. Chapter 4, is particularly well-developed and presents arguable the best writing in the book.



Quotes

"If you happened to find yourself on the banks of the Ohio River on a particular afternoon in the spring of 1806—somewhere just to the north of Wheeling, West Virginia, say—you would probably have noticed a strange makeshift craft drifting lazily down the river. At the time, this particular stretch of the Ohio, wide and brown and bounded on both sides by steep shoulders of land thick with oaks and hickories, fairly boiled with river traffic, as a ramshackle armada of keelboats and barges ferried settlers from the comparative civilization of Pennsylvania to the wilderness of the Northwest Territory.

The peculiar craft you'd have caught sight of that afternoon consisted of a pair of hollowed-out logs that had been lashed together to form a rough catamaran, a sort of canoe plus sidecar. In one of the dugouts lounged the figure of a skinny man of about thirty, who may or may not have been wearing a burlap coffee sack for a shirt and a tin pot for a hat. According to the man in Jefferson County who deemed the scene worth recording, the fellow in the canoe appeared to be snoozing without a care in the world, evidently trusting in the river to take him wherever it was he wanted to go. The other hull, his sidecar, was riding low in the water under the weight of a small mountain of seeds that had been carefully blanketed with moss and mud to keep them from drying out in the sun.

The fellow snoozing in the canoe was John Chapman, already well known to the people in Ohio by his nickname: Johnny Appleseed. He was on his way to Marietta, where the Muskingum River pokes a big hole into the Ohio's northern bank, pointing straight into the heart of the Northwest Territory. Chapman's plan as to plan a tree nursery along one of that river's as-yet-unsettled tributaries, which drain the fertile, thickly forested hills of central Ohio as far north as Mansfield. In all likelihood, Chapman was coming from Allegheny County in western Pennsylvania, to which he returned each year to collect apple seeds, separating them out from the fragrant mounds of pomace that rose by the back door of every cider mill. A single bushel of apple seeds would have been more than enough to plant more than three hundred thousand trees; there's no way of telling how many bushels of seed Chapman had in tow that day, but it's safe to say his catamaran was bearing several whole orchards into the wilderness." (pp. 3-4)

"On a summery October afternoon almost two hundred years later, I found myself on the bank of the Ohio River a few miles south of Steubenville, Ohio, at the exact spot where John Chapman is thought to have set foot in the Northwest Territory for the first time. I'd come here to look for him, or at least that's what I thought I was doing. I wanted to find out what I could about the 'real' Johnny Appleseed, the historical figure behind the Disneyfied folk hero, as well as about the apples in whose story Chapman played such a pivotal role. I figured it would be a modest piece of historical detective work: I'd track down the sites of Chapman's orchards, follow his footsteps (and canoe wake) from western Pennsylvania through central Ohio into Indiana, see if maybe I could find one of the trees he planted. And I did all that, though I'm not sure it got me that much closer to the real John Chapman, a boy who by now has been composted beneath a deep sift of



myth and legend and wishful thinking. I did find another Johnny Appleseed, however, as well as another apple, both of which had been lost." (p. 6)

"That night I went to hear Bill give a talk about Chapman at the Loudonville Historical Society, a stop on his one-man campaign to build support for his Heritage Center and Outdoor Theater. Fifty or so mostly retired folks in folding chairs sipped coffee and listened politely as Jones pressed his case: John Chapman is just the "exemplary figure" to help our children navigate a treacherous world, "yet no one is telling his story." As he spoke, the slide projector showed an early engraving of Chapman made by a woman who had known him in Ohio. Scraggly and barefoot, he's wearing a sackcloth cinched at the waist like a dress and a tin pot on his head; in one hand he's holding out an apple seedling like a scepter. The man looks completely insane. Bill's talk took the rhetorical form of a sermon, with the line "No one is telling his story!" serving as its thumping refrain. He was determined to cut Chapman's life to a Christian pattern, and the stories he told were the ones that made the case for beatification. Protoenvironmentalist. Philanthropist. Friend to children and animals and Indians. It was pap, little more, and I wasn't the only person in the room to grow impatient, especially when Jones got around to the apples, which he praised, incredibly, as "an important source of vitamin C on the frontier." Just then an old guy behind me poked an elbow in his neighbor's ribs and whispered, 'So does he ever get around to the applejack?' He did not. Bill was doing lives of the frontier saints, and there was no place in it for alcohol (or mysticism or romance or psychological weirdness of any kind). The sole mention of cider was cider vinegar, 'vital as a preservative.' (So that's who John Chapman was, patron saint of pickling!) Afterward, as we were packing up Bill's tripods and slides, I asked him about the omission. He smiled. 'Come on, this is a family show.'" (pp. 30-31)

"The tulip's genetic variability has in fact given nature—or, more precisely, natural selection—a great deal to play with. From among the chance mutations thrown out by a flower, nature preserves the rare ones that confer some advantage—brighter color, more perfect symmetry, whatever. For millions of years such features were selected, in effect, by the tulip's pollinators—that is, insects—until the Turks came along and began to cast their own votes. (The Turks did not learn to make deliberate crosses till the 1600s; the novel tulips they prized were said simply to have 'occurred.')

Darwin called such a process artificial, as opposed to natural, selection, but from the flower's point of view, this is a distinction without a difference: individual plants in which a trait desired by either bees or Turks occurred wound up with more offspring. Though we self-importantly regard domestication as something people have done to plants, it is at the same time a strategy by which the plants have exploited us and our desires—even our most idiosyncratic notions of beauty—to advance their own interests. Depending on the environment in which a species finds itself, different adaptations will avail. Mutations that nature would have rejected out of hand in the wild sometimes prove to be brilliant adaptations in an environment that's been shaped by human desire." (p. 81)

"Then, that night, I dreamt about what I'd witnessed, the stiff yellow grid and its solitary red joker. In the dream version the broken tulip appears in the front row, and right



beside it lies a fancy fountain pen, a Montblanc. (This is all too embarrassing to make up.) In a gesture of impetuosity completely out of character, I grab them both, the broken tulip and the pen, and run like a man possessed up Fifth Avenue. I'm flying by the spinning doors of the Plaza and Pierre hotels when I snag the attention of two brass-buttoned doormen standing sentry outside the Pierre. They can have no idea who I am or what I've done, but they leap to and give slapstick chase anyway, their cartoon hollerings—"Stop! Thief!"—sounding in my ears as I tear up the avenue, clutching my tulip and pen and laughing hysterically at the absurdity of it all—the circumstance, but also the dream about it." (p. 100)

"So the flowers begot us, their greatest admirers. In time human desire entered into the natural history of the flower, and the flower did what it has always done: made itself still more beautiful in the eyes of this animal, folding into its very being even the most improbable of our notions and tropes. Now came roses that resembled aroused nymphs, tulip petals in the shape of daggers, peonies bearing the scent of women. We in turn did our part, multiplying the flowers beyond reason, moving their seeds around the planet, writing books to spread their fame and ensure their happiness. For the flower it was the same old story, another grand coevolutionary bargain with a willing, slightly credulous animal—a good deal on the whole, though not nearly as good as the earlier bargain with the bees.

And what about us? How did we make out? We did very well by the flower. There were, of course, the pleasures to the senses, the sustenance of their fruit and seeds, and the vast store of new metaphor. But we gazed even farther into the blossom of a flower and found something more: the crucible of beauty, if not art, and maybe even a glimpse into the meaning of life. For look into a flower, and what do you see? Into the very heart of nature's double nature—that is, the contending energies of creation and dissolution, the spring toward complex form and the tidal pull away from it. Apollo and Dionysus were names the Greeks gave to these two faces of nature, and nowhere in nature is their contest as plain or as poignant as it is in the beauty of a flower and its rapid passing. There, the achievement of order against all odds and its blithe abandonment. There, the perfection of art and the blind flux of nature. There, somehow, both transcendence and necessity. Could that be it—right there, in a flower—the meaning of life?" (pp. 109-110)

"Start with the bright line, as all creatures must. How does one tell the dangerous plants from the ones that merely nourish? Taste is the first tip-off. Plants that don't wish to be eaten often manufacture bitter-tasting alkaloids; by the same token, plants that do wish to be eaten—like the apple—often manufacture a superabundance of sugars in the flesh around their seeds. So as a general rule, sweet is good, bitter bad. Yet it turns out that it is some of the bitter, bad plants that contain the most powerful magic—that can answer our desire to alter the textures and even the contents of our consciousness. There it is, right in the middle of the word intoxication, hidden in plain sight: toxic. The bright line between food and poison might hold, but not the one between poison and desire." (p. 114)

"The swiftness of this change in the weather, the demonizing of a plant that less than twenty years ago was on the cusp of general acceptance, will surely puzzle historians of



the future. They will wonder why it was that the "drug war" of the '80s, '90s, and '00s fought the vast majority of its battles over marijuana. They will wonder why, during this period, Americans jailed more of their citizens than any other country in history, and why one of every three of those were in prison because of their involvement with drugs, nearly fifty thousand of them solely for crimes involving marijuana. And they will wonder why Americans would have been willing to give up so many of their hard-won liberties in the fight against this plant. For in the last years of the twentieth century a series of Supreme Court cases and government actions specifically involving marijuana led to a substantial increase in the power of the government at the expense of the Bill of Rights. As a result of the war against cannabis, Americans are demonstrably less free today." (p. 126)

"The scientists I talked to had a lot to say about the descent and biochemistry of cannabis, but about the plant's effects on our experience of consciousness they were all but silent. What I wanted to know is, What exactly does it mean, biologically, to say a person is "high"? When I put this question to Allyn Howlett, her answer consisted of two rather parched words: 'cognitive dysfunction.' Cognitive dysfunction? Okay, but isn't that a little like saying that having sex elevates one's pulse? It's perfectly true as far as it goes, but it doesn't get you any closer to the heart of the matter—or to the desire. John Morgan, a pharmacologist who has written widely about marijuana, points out that 'we don't yet understand consciousness scientifically, so how can we hope to explain changes in consciousness scientifically?' Mechoulam replied to my questions about what it means biochemically to be high simply by saying, 'I am afraid we have to leave these questions still to the poets.'

So there it seemed the neuroscientists had stranded me, all on my unscientific own with a dime bag and the dubious company of poets such as Allen Ginsberg and Charles Baudelaire, Fitz Hugh Ludlow and (yikes!) Carl Sagan—but Carl Sagan wearing his goofiest nonscientific hat. You see, I'd discovered that in 1971 Sagan had anonymously published an earnest, marvelous account of his experiences with pot, which he credited with 'devastating insights' about the nature of life.

Yet as I proceeded with my literary and phenomenological investigations of the pot experience, I soon realized I had gotten something valuable from the scientists after all. They had inadvertently pointed me in the direction of a deeper understanding of what it is that cannabis does to human consciousness and what, possibly, it has to teach us about it. In fact, Howlett was probably right, if inelegant, in her simple formulation, because I've come to think that a 'cognitive dysfunction' of a very special kind does in fact lie at the heart of it." (pp. 158-159)

"Two stories stand behind the taboos that people in the West have placed on cannabis at various times in its history. Each reflects our anxieties about this remarkable plant, about what its Dionysian power might do to us if it is not resisted or brought under control.

The first, brought back from the Orient by Marco Polo (among others), is the story of the Assassins—or rather, a corruption of the story of the Assassins, which may or may not be apocryphal to begin with. The time is the eleventh century, when a vicious sect called the Assassins, under the absolute control of Hassan ibn al Sabbah (aka 'the Old Man of



the Mountains') is terrorizing Persia, robbing and murdering with brutal abandon. Hassan's marauders will do anything he tells them to, no questions asked; they have lost their fear of death. How does Hassan secure this perfect loyalty? By treating his men to a foretaste of the eternal paradise that will be theirs should they die in his service.

Hassan would begin his initiation of new recruits by giving them so much hashish that they passed out. Hours later the men would awaken to find themselves in the midst of a most beautiful palace garden, laid with sumptuous delicacies and staffed with gorgeous maidens to gratify their every desire. Scattered through this paradise, lying on the ground in pools of blood, are severed heads—actually actors buried to their necks. The heads speak, telling the men of the afterlife and what they will have to do if they hope ever to return to this paradise.

The story was corrupted by the time Marco Polo retold it, so that the hashish was now directly responsible for the violence of the Assassins. (The word itself is a corruption of 'hashish.') By erasing the Assassins' fear of death, the story suggested, hashish freed them to commit the most daring and merciless crimes. The tale became a staple of orientalism and, later, of the campaign to criminalize marijuana in America in the 1930s. Harry J. Anslinger, the first director of the Federal Bureau of Narcotics and the man most responsible for marijuana prohibition, mentioned the Assassins at every opportunity." (pp. 172-173)

"These days the sublime is mostly a kind of vacation, in both a literal and a moral sense. After all, who has a bad word to say about wilderness anymore? By comparison, this other impulse, the desire to exert our control over nature's wildness, bristles with ambiguity. We're unsure about our power in nature, its legitimacy, and its reality, and rightly so. Perhaps more than most, the farmer or the gardener understands that his control is always something of a fiction, depending as it does on luck and weather and much else that is beyond his control. It is only the suspension of disbelief that allows him to plant again every spring, to wade out in the season's uncertainties. Before long the pests will come, the storms and droughts and blights, as if to remind him just how imperfect the human power implied by those pristine rows really is." (p. 184)

"I asked Forsyth to walk me through a season's regimen, the state of the art in the control of a potato field. Typically it begins early in the spring with a soil fumigant; to control nematodes and certain diseases in the soil, potato farmers douse their fields before planting with a chemical toxic enough to kill every trace of microbial life in the soil. Next Forsyth puts down an herbicide—Lexan, Sencor, or Eptam—to 'clean' his field of all weeds. Then, at planting, a systemic insecticide—such as Thimet—is applied to the soil. This will be absorbed by the young seedlings and kill any insect that eats their leaves for several weeks. When the potato seedlings are six inches tall, a second herbicide is sprayed on the field to control weeds. (p. 218)

"The potato famine was the worst catastrophe to befall Europe since the Black Death of 1348. Ireland's population was literally decimated: one in every eight Irishmen—a million people—died of starvation in three years; thousands of others went blind or insane for lack of the vitamins potatoes had supplied. Because the poor laws made anyone who



owned more than a quarter acre of land ineligible for aid, millions of Irish were forced to give up their farms in order to eat; uprooted and desperate, the ones with the energy and wherewithal emigrated to America. Within a decade, Ireland's population was halved and the composition of America's population permanently altered.

Contemporary accounts of the potato famine read like visions of Hell: streets piled with corpses no one had the strength to bury, armies of near-naked beggars who'd pawned their clothes for food, abandoned houses, deserted villages. Disease followed on famine: typhus, cholera, and purpura raced unchecked through the weakened population. People ate weeds, ate pets, ate human flesh. 'The roads are beset with tattered skeletons,' one witness wrote. 'God help the people.' (p. 230)

"Writing or not, all these characters have been actors in a coevolutionary drama, a dance of human and plant desire that has left neither the plants nor the people taking part in it unchanged. Okay, desire might be too strong a word for whatever it is that drives plants to reinvent themselves so that we might do their bidding, but then, our own designs have often been no more willful than the plants'. We too cast unconscious evolutionary votes every time we reach for the most symmetrical flower or the longest french fry. The survival of the sweetest, the most beautiful, or the most intoxicating proceeds according to a dialectical process, a give-and-take between human desire and the universe of all plant possibility. It takes two, but it doesn't take intention, or consciousness.

I keep coming back to that image of John Chapman floating down the Ohio River, snoozing alongside his mountain of apple seeds—seeds that held sleeping within them the apple's American future, the golden age to come. The barefoot crank knew something about how things stand between us and the plants, something we seem to have lost sight of in the two centuries since. He understood, I think, that our destinies on the river of natural history are twined. And while I personally don't think he was right to judge grafting a 'wickedness,' his judgment does bespeak an instinctive feeling for the necessity of wildness and the value of multiplicity over monoculture. Though Chapman would probably disagree, genetic engineering is probably no more wicked than grafting, though it too wars against wildness and multiplicity (albeit much more fiercely). It too places its bet—a very large bet—on the Apollonian One as against the Dionysian Many." (pp. 243-244)



Topics for Discussion

What is your favorite kind of apple? Have you ever eaten fruit from any of the atypical cultivars mentioned in the text? Would you like to try a Newtown Pippin? What does the term "sweetness" mean to you?

Do you find tulips beautiful? Do you prefer monochromatic tulips or "broken" tulips? After reading the book, would you consider adding more tulips to your garden? Can you define what is meant by "beautiful?"

The book suggests that the "war" on marijuana has caused massive erosion of American civil liberties. Do you agree with this assertion? Do you think that marijuana use should be legalized? Discuss.

Have you ever eaten a blue or an orange potato? Would you like to—or do you prefer to stick with the Russet Burbank? Do you think that the Russet Burbank would be a popular potato in the Andean region of South America?

The text describes John Chapman—Johnny Appleseed—as a rudimentary American Dionysus. Do you think this description is more in keeping with the historical figure of Chapman, or is it further conflating the American legend of Johnny Appleseed with the real person?

The text describes Holland's tulipomania as a sort of collective madness. What objects in today's modern culture foster a similar uncontrollable desire? How are all fads and trends a type of tulipomania?

Chapter 3 presents much "scientific" material about marijuana and describes marijuana growing as "...more than a little mad" (p. 138). How do this construction and this word selection link the chapter to the broader "beatnik" and counter-culture literature of marijuana? Discuss.

Do you agree with the book's assertion that occasional intoxication (that is, getting "high" on marijuana) is both useful and benign? Do you agree with the book's assertion that it is impossible for an individual to both worship the Christian God and use marijuana?

The book states "lots of new things happen in the garden...nature supplied the necessary genes or mutations" (p. 185). Discuss how this fact appears to work against the premise of the text that plants and humans are primary drivers of each other's evolution.

In the first three chapters of the book, evolution is described as a process which works on groups of species simultaneously—for example, *Malus domestica* and *M. sieversii*;



the genus *Tulipa*; and *Cannabis sativa*, *C. indica*, and *C. sativa* X *C. indica* hybrids. In Chapter 4, evolution is described as a process working at the species level. Which interpretation of evolutionary processes is more correct?

Throughout the book the contrast between the Greek gods Apollo and Dionysus is presented as a basic dichotomy of the human condition. Describe what the text means by "Apollonian" and "Dionysian" systems. Which system do you prefer? Do you feel that both systems can co-exist within human society and culture?