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Seedless Grapes: Nature and Culture

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A fruit is the mature ovary of a plant. Its main biological function is to ensure the protection and dissemination of the seeds it encloses. In the case of fleshy fruits, dissemination is achieved by attracting animals who eat the fruit, digest the sweet softer flesh, and either regurgitate or excrete the harder seeds at some distance from the plant. Humans, however, have evolved, through artificial selection, plants that produce seedless fruits, such as bananas, Thomson grapes, or Arrufatina clementines. Seedless grapes provide an arresting example of the more general issue I want to address in this chapter. Domesticated plants and animals have simultaneously biological, cultural, and artifactual functions. So do also human bodily traits used artifactually, for instance suntans. How should we describe these functions and their articulation? What are the biological and cultural functions of seedless grapes, or of suntans, and how do these functions interact? In trying to answer such questions, we are led to rethink the relationship between nature and culture, and to reappraise the notion of an artifact.

The notion of an artifact commonly used in the social sciences, particularly in archeology and anthropology, is a family resemblance notion, useful for a first-pass description of various objects and for a vague characterization of scholarly, and in particular museographic, interests. It should not be taken for granted that this notion could be defined precisely enough to serve a genuine theoretical purpose (see also Elder's, Grandy's, and Thomasson's contributions to this volume). When definitions are offered, they are based on prototypical cases. This is true of a dictionary definition such as *Webster's*: 'A usually simple object (as a tool or ornament) showing human workmanship or modification, as distinguished from a natural object.' It is also true of a philosopher's definition such as Risto Hilpinen's in his entry on artifact in the *Stanford Encyclopedia of Philosophy*: 'An artifact may be defined as an object that has been intentionally made or produced for a certain purpose. … Artifacts are contrasted to natural objects; they are products of human actions' (Hilpinen 1999).

Such definitions leave us with a variety of problematic cases, for instance:

1. *Artifacts of which it is not clear to what extent they have been intentionally made*. This includes non-human artifacts such as spiders' webs, beavers' dams, and chimpanzees' termite-fishing sticks. It is of course possible to deny the artifactual character of items that one assumes were not made intentionally, and to say, for instance, that a spider's web is not an artifact whereas a chimp's stick probably is. More difficult are cases of artifacts that resulted from human action without having been clearly foreseen or intended. Consider an old path leading, say, from the village to the river. It started its existence and was maintained by villagers going from the village to the river and back, treading where others have trodden before, thereby marking the path in the landscape and making it easier for others to follow. Individual villagers may never have had any intention other than that of going to, and returning from, the river, but they nevertheless created a path. Is such a path an artifact?[1]

2. *Artifacts that involve no workmanship or modification*. Is a stone used as a paperweight an artifact? Is having been moved sufficient modification? If it is, what about a tree-stump used as a picnic table? If it is not, would, say, cleaning the stone before using it as a paperweight be enough?

3. *Non-standard objects*. Prototypical artifacts are middle-sized, spatially and temporally continuous material objects. Is a multiplication table an artifact, in spite of being an abstract object? Is a word? A queue in front of cinema is made with the intention that people should have access to the theater in the order in which they arrived. Is it an artifact in spite of its being just a temporary spatial configuration of people?

Many organisms, plants or animals, are used by humans for a variety of purposes; they generally show human workmanship and modification; they are artifacts by any reasonable definition, but they are not prototypical ones. Plants and animals used as artifacts provide problematic cases of the three kinds I mentioned. (1) Most of them are the product of artificial selection. Artificial selection, however, is far from being systematically intentional. To quote Darwin (in the first chapter of the *Origin of Species*): 'At the present time, eminent breeders try by methodical selection, with a distinct object in view, to make a new strain or sub-breed … But, for our purpose, a form of selection, which may be called unconscious, and which results from everyone trying to possess and breed from the best individual animals, is more important' (Darwin 1872, 26). Thus, many of the desirable characters of domesticated species were produced by human breeding practices, but were never specifically intended. (2) Some living

[1] Thomasson (this volume), argues that paths are not a kind of artifact, since not all of them were intentionally created to be paths. But what kind of artifact (if any) are those paths that were intentionally created as such? And what about (this is my point here) cases where the intention to create or maintain a path as a path played a marginal role in their creation or maintenance?

creatures are used as artifacts without having been domesticated. For instance, live leeches (*Hirudo medicinalis*) have been used in medicine since antiquity to let blood from patients. Being very well suited for this purpose, and being easily found in fresh waters, they were not bred (until very recently) and not modified by humans. (3) Plants and animals are, obviously, not the kinds of object that come to mind as possible artifacts. In particular, unlike prototypical artifacts such as hammers, they can hardly be contrasted to natural objects. In fact, they seem to blur the nature–culture distinction.[2]

Problems arise as soon as we ask of a biological artifact: What is it for? For common sense, the question 'What is it for?'—or, in a more sophisticated form, 'What is its function?'—can properly be asked of two classes of things: biological traits such as wings and thorns, and artifacts such as chairs, violins, and sugar cubes. These two classes of things are seen as disjoint and as having functions in two different senses of the term. They epitomize the contrast between nature and culture. Given that the two classes actually overlap, some conceptual house-cleaning is called for. For this, I outline a framework inspired by Ruth Millikan (1984, 1993), and drawing on earlier work with Gloria Origgi (Origgi and Sperber 2000). (See also Allen, Bekoff, and Lauder 1988; Elder, this volume.)

1. BIOLOGICAL, CULTURAL, AND ARTIFACTUAL FUNCTIONS

When one talks of function, be it that of a biological or that of an artifactual item, one is referring to an effect of this item (Wright 1973). The function of a biological feature is a *selected effect* (Neander 1991). A selected effect of a biological feature is an effect that has contributed to the reproductive success of organisms endowed with the trait and, thereby, to the propagation of the trait itself. Fleshy fruits have many effects: they add weight to the plants that hold them and sometimes break branches, they attract insects, and they attract larger animals that eat them whole and disperse the seeds, contributing to the reproductive success of the plant and, thereby, to the multiplication of the fruits themselves. Fleshy fruits have been selected in biological evolution to recruit animals for the dispersal of the seeds they contain. This effect is their function.

The function of an artifact, on the other hand, is an *intended effect*. Sugar cubes take up space in cupboards, add weight to the drinks in which they are dropped, and sweeten them. Sugar cubes are made and used in order to sweeten the drinks in which they are dropped. This intended effect is their function.

This classical dichotomy between biological vs. artifactual function (see Fig. 7.1) goes well with the common sense nature–culture contrast: on the side

[2] See also Bloom's, Elder's, and Grandy's contributions to this volume for similar considerations.

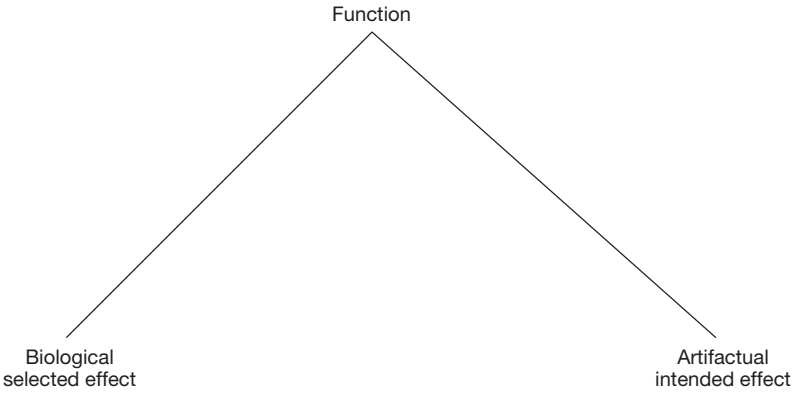

Figure 7.1. A classical dichotomy of functions

of nature, a mindless causality which happens—Darwin explained how—to give the appearance of intentional design; on the side of culture, the causal power of minds and true intentional design. This picture, however, is partial and misleading. Biological artifacts blur the dichotomy. Moreover, as has been argued by Millikan and others, biological functions are a special case of a wider category of 'teleofunctions', which includes not just biological but also cultural cases.

Often, the idea that not only biological traits but also cultural traits have teleofunctions is equated with the idea that Darwinian selection is not confined to the biological sphere and is also found in the cultural sphere. Dawkins in particular has suggested that culture is made of 'memes' and evolves through a process of Darwinian selection among these memes analogous to the selection of genes in biological evolution (1976). I agree that cultural traits have teleofunctions, and I agree that Darwinian selection is not confined to biology, but I don't think the two ideas should be equated. Darwinian selection is only one of the possible mechanisms through which populations of items may propagate and evolve. Darwinian selection operates among items that exhibit descent and heritability, that is, among 'replicators'. However, non-replicating items may also propagate. This is the case, for instance, when a behavior propagates through stimulus enhancement.

The opening of milk bottles by tits in Britain, a famous example of a non-human cultural trait, is now believed to have spread, not by imitation of the whole behavior, but by a disposition of tits to peck at what they see other tits picking at, and by each tit discovering for itself that pecking at the top of milk bottles was rewarded with cream. The spread of addictions among humans provides comparable cases. Tobacco addiction is triggered by the behavior of other smokers but is not inherited from them; rather, it owes many of its crucial features to a susceptibility to nicotine (a susceptibility that is itself biologically

rather than culturally inherited, and, of course, inherited from non-smoking as easily as from smoking parents). I have argued in favor of an epidemiological approach to culture where infectious diseases do not provide the sole, and not even the main, analogy for the spread of cultural things: much of culture spreads like addictions rather than like viruses (Sperber 1996, 2000). These considerations are of relevance to an account of the role of biological artifacts (more so than I will be able to show here). This is why I propose a broad definition of teleofunction that applies not just to replicators, but to all 'propagators'.

Let us say that an effect of type F is a *teleofunction* of items of type A just in case the fact that A items have produced F effects helps explain the fact that A items propagate, i.e. keep being re-produced. (I am using 'propagation' as a synonym of repeated re-production, and 're-produce' rather than 'reproduce' to avoid the suggestion that new tokens of a type of items have to inherit all their relevant properties from previous tokens of the type.)

Typically, biological and cultural teleofunctions involve different kinds of items and different propagation mechanisms.

Items capable of having *biological teleofunctions* are phenotypical features of organisms (which may include not just bodily features but also behavioral features such as nest-building behavior in birds and outcomes of these behaviors such as the nests themselves—I am adopting Dawkins's notion of an 'extended phenotype'—see Dawkins 1982). The biological function of a trait helps explain the reproductive success (in the standard biological sense) of organisms endowed with this trait and therefore the propagation of the trait itself. The case of fleshy fruits is an example in point.

Items capable of having *cultural teleofunctions* are of two kinds: mental representations and public productions. Mental representations are constructed within agents by mental processes. By 'public productions', I mean both behaviors (e.g. speech) and traces of behavior (e.g. writings) that can be perceived and therefore serve as input to the mental processes of other agents. Public productions are guided by the mental representations of agents, and in turn may cause the construction of mental representations in other agents. It is through public productions that the mental state of one individual affects the mental state of another. Cultural items propagate through complex causal chains where mental representations and public productions alternate: mental representations of some given tenor favor the production of behaviors and objects of some given form, and these in turn favor the production of more mental representations of the same tenor (Sperber 1996).

Consider, as an illustration, mental representations of suntanned people as attractive and actual suntans (i.e. public productions). These are items of which it may be asked whether they have a cultural function, and if so, which. Before the Industrial Revolution, when poorer people were working outdoors and couldn't help being suntanned, pallor, then a privilege of the middle and upper classes, was seen as more becoming. In contemporary society most work is done indoors,

and sporting a suntan is now evidence of leisure and travels, and is evocative of a privileged condition or at least of good times. This induces people to view a suntan as attractive, which encourages them to suntan, and so on, in a self-perpetuating causal loop. The teleofunctions of cultural mental representations (e.g. of suntans as attractive) and of cultural productions (e.g. actual suntans) are those of their effects that help explain the self-perpetuating character of the causal chains that propagate these representations and productions.

Teleofunctions are, by their very definition, effects of items that are produced again and again, the production of later items being caused in part by earlier items. The function of an artifact qua artifact, on the other hand, does not necessarily depend on its being a token of a propagated type. It just depends on its having been intended by whoever devised the artifact. A nonce artifact can be devised for some odd purpose: one might, for instance, fold a tree leaf as a tool for retrieving a ring fallen between two floorboards. Such an artifact could be causally unrelated to any artifact of the same type and nevertheless have a clear function, that of retrieving the ring. Another way of making the same point is to say that an artifactual function is an effect that explains why the artifact is being produced, whereas the teleofunction of an item is an effect that explains why this item is being re-produced.

Still, most artifacts are tokens of a type and are causally related to previous tokens. They are, that is, cultural productions. In other terms, most human artifacts are *cultural artifacts*. This is not surprising. Humans have to perform again and again very similar tasks, and the best way to do so is, quite generally, to take advantage of a type of artifact already devised and produced for this type of task. When an artifact is a cultural production, it has, as such, cultural teleofunctions. Token artifacts of the same type have repeatedly had an effect that explains why they keep being re-produced. What characterizes cultural artifacts is that one of their cultural teleofunctions and their artifactual function, that is, their intended effect, coincide. The fact that artifacts of a given type have in the past produced their intended effect causes people to expect such artifacts to produce these effects in the future, which causes them to make (or have made for them) new artifacts of the same type in order to produce the same effect. Thus new sugar cubes are being produced with the expectation and intention that, by dissolving, they will sweeten hot drinks (this is their intended effect) because sugar cubes have reliably had this effect in the past (and therefore this is also their teleofunction).

In the causal chain that explains the re-production of cultural artifacts, the intention that the artifact should have a specific effect and the mental representations and attitudes that cause people to repeatedly form such intentions play an essential causal role. These mental items may themselves get re-produced by the kind of causal chain I was evoking. In this case, they have a cultural function but, typically, they do not themselves have an intended effect or a purpose: they are not artifacts. Suntans are artifacts. They are produced with the

intention of one's being perceived as an attractive person, and in succeeding in doing so, they cause their own propagation. The belief that suntanned people are attractive causes its own propagation through its behavioral effects. However, the belief is just believed. It is not held with the higher-order intention that holding the belief should cause some specific effect. It is a cultural belief with a cultural function, but it is not a cultural artifact.[3]

Ordinary, prototypical cultural artifacts are, I have suggested, characterized by the coincidence of two types of function: an artifactual function and a cultural teleofunction. This coincidence is, of course, found also in cultural artifacts of a biological kind. Leeches, for instance have the artifactual function of letting blood. This is the intended effect for which they are used. This is also the effect the use of leeches has produced in the past and which causes people to go on using them expecting the same effect. In other words, the artifactual and a cultural function of leeches coincide. Biological artifacts, being biological, have, on top of their artifactual and cultural functions, biological teleofunctions. Leeches feed by attaching their suckers onto the skin of other animals, cutting with some 300 teeth into the victim's skin. Their saliva contains substances that anesthetize the wound area, dilate blood-vessels, and prevent coagulation. The effective feeding of leeches by means of these complex effects has contributed to their reproductive success. These effects are biological teleofunctions. It is by performing these biological functions that the leech's feeding mechanism, applied on a patient's skin, performs its cultural/artifactual function of letting blood. So, in the case of a biological cultural artifact, we have not only a coincidence of artifactual functions and cultural teleofunctions, but also of these and biological teleofunctions of the biological item artifactually used.

Suntans are another example. A suntan is, to begin with, a biological adaptation. When the skin is exposed to sunlight, melanocytes found in the epidermis increase the production of melanin, a brown pigment that forms a protective barrier against sunburn and the carcinogenic actions of ultraviolet rays. The artifactual production of a suntan through deliberate exposure to sunlight or to artificial UV light exploits this biological mechanism. The resulting suntan has simultaneously its biological, its cultural, and its artifactual functions.

In general, the use of all artifacts exploits causally potent properties that exist quite independently of their artifactual exploitation. Thus paperweights exploit simple physical properties of heavy materials and sugar cubes exploit physico-chemical properties of crystallized sugar. Similarly, an artifact may exploit the

[3] In general, a belief is not an artifact from the point of view of the believers: it is not held for a purpose. From the point of view of suntan-lotion producing companies, however, the perception of suntans as attractive is something that they try to promote through advertising, with the goal of better selling their products. Hence, it would make sense to call the widespread belief in the attractiveness of suntans an artifact partly devised by these companies. More generally, the mental states of some people may be other people's artifacts. My hunch is, however, that pushing this line of thought would just, once again, show how confusing the notion of an artifact can be.

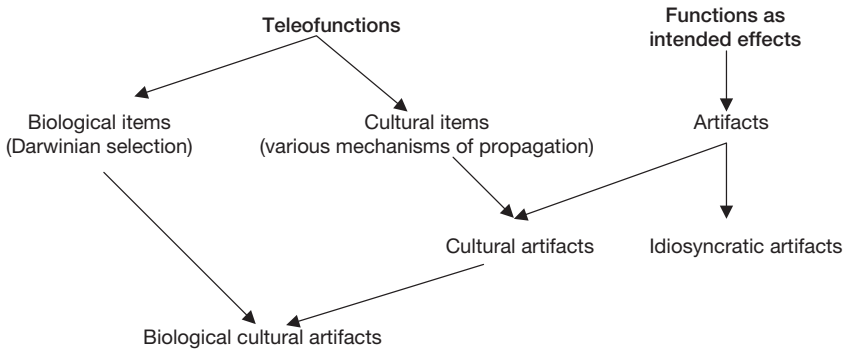

Figure 7.2. Functions and artifacts

biological properties of some biological item. Those which do so I call biological artifacts. Not all properties of a biological item are biological properties. An artifact may exploit just some non-biological properties of some biological material. In this case, it is not a biological artifact in the intended sense. For instance, an ivory paperweight exploits a physical property—the weight—of a biological item—a piece of elephant—but it is not an instance of a biological artifact. Biological artifacts, as I use the expression, perform their artifactual function by performing some of their biological functions.

We have now moved away from the simple dichotomy of functions illustrated in Figure 7.1, and have made and illustrated a number of finer distinctions schematized in Figure 7.2. Biological cultural artifacts are simultaneously artifacts, cultural items, and biological items. As such, they have artifactual functions, that is, intended effects, cultural teleofunctions, and biological teleofunctions. Their intended effect is identical to one of their cultural teleofunctions. That is, their past performance of their intended effect causes them to be culturally re-produced. This is what makes them *cultural* artifacts. Moreover, their artifactual/cultural function is achieved by means of the performance of one of their biological functions. This is what makes them *biological* cultural artifacts.

2. BIOLOGY AND CULTURE

The point of distinguishing different types of functions in biological artifacts and of describing their articulation is not taxonomic or descriptive per se. It is explanatory. The notion of a function is an explanatory one. A teleofunction is an effect that explains the propagation of items having that effect. The propagation of a biological artifact may be both a biological and a cultural phenomenon and it may call for a joint biological and cultural explanation. This goes against standard social science practice. For most social scientists, be they individualists or holists,

explanations of social facts are to be given in terms of people's intentions and actions (for individualists) or in terms of social representations, institutions, and forces (for holists). All 'lower lever' causal factors involved, be they physical, chemical, or biological, are considered part of background conditions. Natural ingredients are seen as just part of the material to be taken into account and possibly shaped by psychological and/or social forces.

From the kind of naturalistic point of view I defend, there are only natural causes. Psychological and social causes, if they are genuine, are natural. In particular, intentions and other mental representations are biological phenomena with natural causal powers. They have a role to play in naturalistic explanations, but they hold no particular explanatory privilege. Any state of affairs is brought about by many and sundry causal factors. Which among these causal factors should be highlighted in a given explanation is a pragmatic matter. If, for instance, your ultimate interest is in establishing responsibilities, then, of course, you will give pride of place to intentions among causes. If, however, your interest is more scientific and you want your explanation of a phenomenon to be comprehensive, general, and contributing to a wider, integrated understanding of the world, then the causal factors you will highlight are those which, in the case at hand, best contribute to an explanation having these virtues.

In particular, when you want to explain the cultural character of a biological artifact, then you have from the start at your disposal two types of causal factors: the biological teleofunctions of the artifact, and its cultural teleofunctions. The fact that artifactual/cultural functions involve intentions whereas biological functions do not does not automatically make the former more potent, relevant, or explanatory than the latter. The issue, rather, is in each case to evaluate the causal role played by each type of function. By the definition of a biological artifact, its cultural function exploits its biological function. The issue is whether and to what extent, conversely, the biological function of a biological artifact exploits its cultural function, that is, is causally potent in shaping the propagation process.

Compare, from this point of view, the case of leeches and that of cereal seeds.

Leeches used for letting blood were enjoying their last meal (since once used they were destroyed). While their feeding mechanism performed its proximal teleofunction of feeding the animal, it did so in conditions where more distal functions, such as keeping the leech healthy, and, ultimately, contributing to its reproductive success, were forever thwarted. The artifactual usage of leeches exploited properties of their feeding mechanism that are explained by its biological functions, but it did not serve these biological functions. It did not contribute to a greater reproductive success of leeches particularly well-suited for blood-letting and did not therefore result in the evolution of an artificially selected species of leeches. In the absence of a positive feedback of the artifactual usage of leeches on their reproductive success, there is no co-evolutionary story between the biology of leeches and their cultural usage. In such a case, the biological function is

just an opportunity provided by nature and artifactually exploited. It can be treated as a background factor in the explanation of the cultural artifact, just as standard social science would have it. Are leeches, in this respect, typical biological artifacts? Not at all.

One of the biological functions of seeds is the dispersal and reproduction of the plant. Dispersal can be achieved, in different species, by wind, water, or animals. Shape, size, color, smell, placement on the plant, may play a role in animal dispersal of seeds, which is done in a wide variety of ways. Arguably, the best animal agents of dispersal ever recruited by seeds are humans. In the case of cereals, for instance, humans use the seeds primarily as food. When, some 13,000 years ago, humans started cultivating, rather than merely collecting, barley and wheat, they found a second use for seeds, namely the sowing of the plant where and when they wanted. In other terms, humans were starting to use seeds as a biological artifact to perform the seed's main standard biological function: the dispersal and reproduction of the plant. The ancestors of wheat and barley could, at that point, evolve in two directions. They could stay, or become, less attractive as food for humans, hard to collect and to process, less palatable; by so doing they would be spared having most of their seeds eaten by humans (but of course, seeds have other predators) and they would go on reproducing as they had before attracting human attention. Or they could evolve so as to become more attractive to humans, with bigger, more nutritious grains, with more solid stalks to make collecting the grains easier (whereas the easily broken stalks of wild cereals are better for natural dispersal), and so on, and count on humans to make sure that the seeds retained for sowing would be properly protected until the right time, sown in the best possible soil, given the right amount of water, and so on. Cereals that evolved in this second fashion did much better than the wild varieties, by securing human help. Today they cover a significant proportion of fertile lands.

Of course, the story of the evolution of cultivated cereals can be, and generally is, told from the human point of view: by artificial selection, humans engineered the kind of cereals they wanted, and invested in their cultivation the efforts they deemed worthwhile. Seen from this point of view (and, after all, only humans have a point of view, plants don't), the cultivation of cereals is not so different from the fabrication of stone or metal tools: humans take advantage of opportunities provided by nature. There are, however, a number of objections to such an account. Artificial selection is a variety of natural selection: it creates an environment in which evolving traits desirable to humans increases fitness. In particular, it can be quite advantageous for a plant to have a large proportion of its seeds used by humans as food, provided that the remainder of the seeds serves the goal of reproduction and dispersal in a particularly efficient way. When this became the case for various species of cereals, feeding humans became a biological teleofunction of the seeds, that is, an effect that contributed to the greater reproductive success of varieties of cereal providing better food. Both

the feeding function and the reproduction function of seeds are simultaneously biological and cultural/artifactual functions of cultivated cereal. The plants take biological advantage of their cultural functions and humans exploit culturally, and more specifically economically, some of the biological functions of the plants. There has been a co-evolution of the plants and of their cultural role. Human culture has adapted to cereal biology just as cereals have adapted to human culture.

Moreover, as Darwin's quote at the beginning of this chapter reminded us, artificial selection has been, for a large part, unconscious. Artificial selection is selection for traits that may turn out to be desirable to humans, whether or not they have actually been foreseen, desired, and planned by humans. Many artificially selected traits have emerged unforeseen and have seduced humans, shaping human taste and guiding human economic behavior. Here are a couple of further illustrations.

Human mental states are altered by the consumption of cannabis because it is the biological function of one of its chemical components, tetrahydrocannabinol (THC), to alter the mental states of animals.[4] This proximal effect has normally the more distal function of protecting the plant from animal consumption. To put it more graphically than accurately (since how this normal function exactly works is a matter of speculation), the animals become quickly too stoned to go on bothering the plant. In the human case, this psychotropic effect actually causes rather than impedes consumption. This, however, contributes to the reproductive success and the evolution of the plant, the propagation of which becomes actively pursued by humans. As a result, THC has now the additional biological function of causing pleasure and addiction in humans, which contributes to explaining the propagation of the plant, and is evolving towards an ever better fulfillment of this function. Of course, here too, it remains possible to tell the story from a human intentional perspective, treating the biological properties of cannabis as mere background: humans stumbled on the psychotropic properties of cannabis, liked them, and started cultivating and modifying the plant to suit their taste. In this story, the taste for cannabis and its motivating power are treated as mere givens. A more comprehensive story would provide a biological explanation of the taste for cannabis and a co-evolutionary account of the biological evolution of cultivated cannabis and of its cultural role. Of course, in this story, only humans have a genuine interest and point of view, but both humans and plants have causal powers and these powers interact with comparable weights.

Domesticated dogs (*Canis familiaris*) may seem to provide a paradigmatic illustration of humans' ability to modify other living kinds and turn them into artifacts.[5] Out of a single species, humans have, to suit a variety of purposes, bred hundreds of quite different breeds: pointers, retrievers, other hunting dogs, terriers initially bred to dig out burrowing rodents, pit-bulls bred to fight each

[4] For this example, I am drawing on Pollan 2001.
[5] For this example, I am drawing on Budiansky 2000.

other in pits, shepherds, watchdogs, toy dogs, and so forth. However, this complacent picture of human control of canine nature does not withstand scrutiny. The archeological record and genetic evidence suggest that, many thousands of years before humans began taking advantage of dogs, the ancestors of dogs began taking advantage of humans, hanging around their camps as scavengers (as still do 'village dogs' in many parts of Africa). Dogs' ancestors even began evolving from regular wolves to a new species adapted to life in the vicinity of humans. In particular, they began modifying expressive behaviors involved in their own social life in a way that would elicit sympathetic interpretations on the part of humans. As Budiansky (2000, 29) writes: 'We can't help seeing a humanlike purpose in the things around us. Thanks to the wolf social structure, dogs were prewired in many ways to exploit this foible of ours to a tee.'

Dogs evolved so as to cause their acceptance by humans. Domestication was the crowning of this evolutionary process and started a co-evolutionary process between canine biology and human culture. In this co-evolution, the reproductive success of dogs was extraordinarily well served. There are approximately 100,000 wolves left in the world, while dogs may be a thousand times more numerous. As a result of domestication, some dogs have had to work hard, but many others have enjoyed a life of leisure. In contemporary society in particular, dogs exert a degree of control over the lives of their owners that is comparable to, and often higher than, the control that owners exert on them. Dogs impose their tastes in food, their daily rhythms, their preference for cozy places in the house, their noisy and dirty habits. They are fed, washed, walked, and taken to the vet when needed, and have very little to do in return. Humans may feel that they are getting from their dogs just what they want and that the costs involved are well worth it, and, surely, if they say so, then it is so. However, human wants themselves have been and are manipulated by dogs, or, if 'manipulated' is too intentional, have been altered by the biological evolution of dogs and are stimulated by dog behavior to suit dogs' own wants.

Biological artifacts are cultural things, that is, they propagate in the human environment as an effect of human thought and action. Their propagation, however, is not achieved by a cultural copying process, but by the cultural exploitation of biological reproduction. In other words, their cultural functions are achieved, at least in part, through the achievement of their biological functions. These biological functions are, at least in part, adaptations to the human cultural environment. The seedless grapes of the title illustrate this last point perfectly. They don't serve the standard function of fleshy fruit to recruit animals for the dispersion of seeds, since they are seedless. They might seem, then, to be just artifacts serving the cultural purpose of facilitating the consumption and digestion of table grapes and raisins. However, this would miss the novel biological function that grapes have evolved in the human environment. Just as cereal seeds, grapes have evolved the function of attracting humans as food and thereby securing their involvement in the plant's reproduction. In the

case of cereal, this is done by a percentage of the seed being kept and used for sowing. Grapes, however, are generally propagated not by sowing but by means of cuttings or grafts. Their seeds have, on the whole, lost their original biological function. Worse, seeds go against the new biological function of attracting humans. Seedless grapes, then, have a reproductive advantage over seeded varieties of table grapes: they are better at recruiting humans for their own reproduction. Their most cultural trait—their seedlessness—is also an optimal biological adaptation.

3. CONCLUSION

The fact that biological artifacts don't immediately come to mind as instances of the category of artifacts is rather puzzling. Biological artifacts are very common. After the Neolithic revolution some 13,000 years ago, and until the industrial age, they were the most common artifacts in the human environment. Most people had more domesticated plants and animals than tools, clothes, weapons, furniture, and other inert artifacts. Why should, then, the notion of an artifact be psychologically based on a prototype which is not all that representative? Why couldn't we, at least, have two prototypes of artifacts (as we have two prototypes of birds, one sparrow-like, the other eagle-like)? Maybe because, during the long Paleolithic era, simple inert tools were the only artifacts humans had. If there is some innate basis for our notion of an artifact, it probably evolved in an environment where stone tools were indeed prototypical, and a mere 13,000 years with domesticated plants and animals around was not sufficient to displace this mental habit. Moreover, for urban populations, especially after the Industrial Revolution, if not exactly inert, then at least lifeless objects became, for a second time, the most common artifacts.

We are now, however, in the middle of two technological revolutions which will again change the picture. The information technology revolution is progressively furnishing our environment with artifacts that are not only active, like a number of artifacts of the industrial age already were, but that are also interactive and endowed with information-processing capacities. Computers, robots, and their software are no more prototypical artifacts than cannabis and dogs. Their evolution won't be that of human intentions realized in some inert material, they and humans will co-evolve. The biotechnological revolution, with direct manipulation of genes, may, on the other hand, render biological functions of biological artifacts less relevant to their cultural becoming (or differently relevant if genetic engineering ends up having major unforeseen evolutionary consequences). What all this suggest is that, in taking artifacts as a proper category for scientific and philosophical theorizing, we are being deluded by a doubly obsolete industrial-age revival of a Paleolithic categorization.

Here I have tried to cast doubt on the idea that a theoretically useful notion of artifact can be built around its usual prototypes: bracelets, jars, hammers, and other inert objects, or that it can be defined in a more systematic way. There is a continuum of cases between public productions that are well characterized by a specific purpose and others where purpose is unclear. There is also a continuum of cases between public productions that are wholly designed by humans, and others where humans exploit, with little or no modification, a pre-existing structure. Biological artifacts vary in the degree to which they serve a well-defined purpose. Even when they do, this provides at best only a very partial explanation of their complex structure. There is no good reason why a naturalistic social science should treat separately, or even give pride of place to, cultural productions that are both more clearly intended for a purpose and more thoroughly designed by humans, that is, to prototypical artifacts. In fact, I see no reason why a naturalistic social science should categorically distinguish cultural artifacts from other cultural productions.