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# Virtual Objects

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What should be done theoretically regarding those "virtual objects" that James J. Gibson refers to several times in his last book? Does not Gibson's view that we visually perceive, sometimes, items that are merely "virtual" produce a contradiction within his theory of visual perceiving? How can something unable itself to have effects on what occurs in the visual system justifiably be claimed to be an object of visual perceiving? I address among other issues: whether there is a sense in which a theory that treats of perceiving as direct can allow for the visual perceiving of "virtual objects." Also, with specific reference to seven cases of perceived "virtual objects" according to Gibson, I argue against the notion that something "virtual" is what is visually perceived. In the seven cases, the visually perceived items either are, have been, or will be actual parts of the one and only world that we all inhabit or they have no existence. I conclude with comment pertaining to the question: Should physical presence — that is, an item's stimulational presence in relation to our visual system — be necessary for us to be said to perceive that item?

## A Place for "Virtual Objects" in the World of Fact?

### *Questions Arise*

If, as Gibson (1979/1986, p. 239) has claimed, visual perceptual awareness is always *of* something belonging to the ecological environment, or *of* something of the perceiver himself or herself, or *of* both of these at once, the questions perforce arise: What should be done theoretically about those "virtual objects" to which Gibson refers at several points in *The Ecological Approach to Visual Perception?* Does not Gibson's additional view — that we visually per-

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ceive, sometimes, items which are merely "virtual" — produce a contradiction within his very influential theory of visual perceiving?

After all, the general Gibsonian account explicitly holds that the process of visual perceiving has evolved in such a way as to be directed cognitively upon the one and only concrete world which all of us physically inhabit, and upon ourselves as part of that same ecological reality (Natsoulas, 1994a). However, among the perceived "virtual objects," in Gibson's sense, are items that have never existed and will never come into existence. This particular large category of "virtual objects" is made up of imaginary, impossible things that are, anyway, items visually experienced under certain perceptual conditions. If one tries to conceive of them as being themselves visually perceived, one immediately finds oneself faced with a difficult problem: How can something that cannot possibly itself have any effects on what takes place in the visual perceptual system be justifiably claimed an object of visual perceiving?

In my view, adoption of the notion that we visually perceive, as well, imaginary "virtual objects" would require us to extend the sense of *visual perceiving* much too far — to a point where, by being too inclusive, the phrase loses its usefulness for psychological science. Analogously, when a person succeeds in grasping the point of what someone else is saying, the person does not literally see the point; that is, psychologists rightly refuse to treat of understanding on the model of visual perceiving. Note, too, that, on Gibson's (e.g., 1979/1986, p. 151) own theory, whatever items are to be visually perceived must provide something of the structure of their own surfaces to the discontinuities in the light reaching the perceiver's eye; in the absence of all such photic discontinuities, no surface should be visually perceived.

*Kinds of "Virtual Objects"*

Gibson's describing an object, place, event, or person as "virtual" does not necessarily mean that this item is also unreal, as well as being "virtual" with reference to a particular perceptual situation. There are both real "virtual objects" and "virtual objects" that are not real. Although some "virtual objects" have no existence, whether in the past, present, or future, (e.g., the legendary king Gilgamesh), others of them have existed for a time but no longer exist now (e.g., Mohandas K. Gandhi) and still other "virtual objects" do currently exist, not having as yet gone out of existence (e.g., the Great Wall of China). However, whereas the items in the latter category of "virtual objects" have present existence, they are, on those particular occasions when they would be said by Gibson to be "virtual objects," neither parts of the perceiver nor parts of the perceiver's immediate environment.

Thus, for Gibson to describe a "virtual object" that exists as visually perceived, the item need not be itself reflecting or radiating light to the per-

ceiver's point of observation. Nor, for that matter, does a "virtual object" need to be such as to possess the latter capability. For example, on particular occasions, a fire-breathing dragon may be a "virtual object" although this item always qualifies as being unreal and as incapable of having any effects at all.

Those who would disagree with the latter claim would very likely have in mind the psychological and physiological effects on the individual of something like his or her hallucinating a fire-breathing dragon. I have no doubt that, experiencing a fire-breathing dragon, one may become more terrified than one has ever been of anything. But, surely, quite a different process would be responsible than, *per impossibile*, a fire-breathing dragon's producing effects on one itself. What this case illustrates is the power of the stream of experience, certainly not the power of unreal things.

*Theoretical Revisions*

What is the proper theoretical task for psychologists of perception to undertake with respect to "virtual objects"? I have in mind especially those psychologists, such as myself, who are in basic sympathy with Gibson's ecological approach to visual perceiving. Should we (a) set to work to eliminate from the approach all references to "virtual objects" in Gibson's sense? Or should we, instead, assuming it is possible, (b) seek to find a suitable theoretical place for the "virtual," a place that is consistent with the remainder of the ecological approach? There is, of course, another, less attractive option: we could (c) try to introduce fundamental changes into the ecological approach that would allow the visual perceiving of items which themselves cannot, at any point, affect the functioning of the visual system.

For example, Clark (1996, p. 494) holds that the "virtual objects" to which Gibson (1979/1986) makes reference as being themselves visually perceived are, qua representational, sufficient to "launch" a psychological field of visual appearances, that is, a visual field made up of intentional objects that are represented in the process of perceiving. However, the theoretical introduction of Clark's kind of phenomenal visual field would clearly constitute a direct contradiction of a fundamental thesis of Gibson's (1979/1986, p. 239): there exists no separate content of perceptual awareness, distinct from what an observer perceives in the environment or of himself or herself (cf. Reed, 1987, p. 105; Coulter and Parsons, 1990, p. 259).

Indeed, note that, in his last book, Gibson (1979/1986, e.g., pp. 195 and 286) begins to make a particular major revision in his theory pertaining to the place therein of perceptual content. A residual kind of content, which Gibson (e.g., 1950) has recognized and treated of for thirty years is now to be eliminated — leaving no content at all in the theory beyond the world of

objective (ecological) matters said to be perceived. Whereas the visual perceiver does have a "field of view," consisting of the solid angle of light that can be registered at the moment by his or her ocular system, he or she does not possess a "visual field," which previously was described to consist of visual sensations (Gibson, 1963/1982).

*The Seen-Now-from-Here*

This revision in Gibson's theory would provide a suitable ecological replacement for his concept of the "visual field"; that is, the same or very similar functions would be served, instead, by the "seen-now-from-here" (Natsoulas, 1989a). The latter is a brand-new Gibsonian concept, which has reference to something in particular that lies externally to the visual system. The "seen-now-from-here" is equivalent to the totality of environmental and bodily surfaces and parts of such surfaces that are now unobstructedly projecting (i.e., reflecting or radiating) light to the perceiver's point of observation. These "here-and-now surfaces," as Gibson also calls the seen-now-from-here, are the surfaces which, at the present moment, face the perceiver and which the perceiver now faces (Gibson, 1979/1986, p. 286). Not all parts of the perceiver's immediate environment are thus projecting, for there are, as well, "occluded" surfaces lying behind the surfaces facing the perceiver and behind the perceiver's head. The perceiver's head obstructs a good portion of the surrounding environment from reflecting or radiating light directly to the point of observation which the perceiver is occupying now.

Thus, the seen-now-from-here is a certain segment of the ecological environment, whereas the purported referent of Gibson's concept of the visual field was supposed to be something experiential, a kind of experience, taking place consciously within the visual system. See, for example, Gibson's (1979/1986, pp. 285–286) brief section titled "The Consciousness of the Visual Field." In Gibson's new view, upon adopting an attitude of introspection with respect to one's activity of visual perceiving, what one becomes aware of is not as Gibson had held all along, namely, a field of visual sensations. Rather, one distinguishes perceptually those environmental and bodily surfaces, or parts thereof, that are both facing one's present point of observation and reflecting or radiating light directly into one's eyes.[1]

[1]That is, when engaged introspectively with regard to one's visual perceiving, one distinguishes the here-and-now surfaces from other environmental surfaces that are not part of the seen-now-from-here. Thus, as part of one's visually perceiving the environment, which is a process of "direct" perceiving (see below in the text), one has awareness as well of surfaces even after these surfaces have become occluded (e.g., Gibson, e. g., 1977/1982, p. 289, 1979/1986, p. 195).

*The "Directness" of Perceiving*

In the process of their being visually perceived, some "virtual objects" do have effects on the stimulus flux at the photoreceptors — while other "virtual objects" that also exist do not themselves project any light to the perceiver's point of observation in the process of their being visually perceived qua "virtual objects." A stimulationally effective "virtual object" is exemplified in an experiment of Gibson's (1950, pp. 178ff). In that experiment, the inner structure of the large photic solid angle at the point of observation is partially determined by an object that, in fact, is being invisibly supported so that it has an actual location up above the ground. But the object appears instead, under the particular experimental conditions of observation, to be resting on the ground.

Gibson (1979/1986, p. 159) speaks of what is perceived in this experiment as a "virtual object." However, it seems to me to be, rather, a case of direct perceiving in Gibson's own sense, albeit with an illusory dimension. I shall consider this example of a "virtual object," among others, in this article's last main section, which is titled "Do Virtual Objects Exist?" The second main section, "Inefficacious 'Virtual Objects,'" addresses whether there is a sense in which a theory that crucially treats of perceiving as direct is able, without contradicting itself, to allow for the perceiving of items that have absolutely no effect themselves on the stimulus energy flux at the sense receptors. But first, let me provide some brief explication of Gibson's proposed directness of the process of perceiving.

In his final book, Gibson (1979/1986) explains,

> Direct perception is what one gets from seeing Niagara Falls, say, as distinguished from seeing a picture of it. The latter kind of perception is *mediated*. So when I assert that perception of the environment is direct, I mean that it is not mediated by *retinal* pictures, *neural* pictures, or *mental* pictures. (p. 147)

In Gibson's view, all perception is direct. This means that a perceiver never has to apprehend something else (e.g., any of the last three kinds of items mentioned in the above quotation) to perceive whatever he or she may perceive. That is, perceiving is not an inferential or associative process wherein either (a) one apprehends X and infers from the fact that one has so apprehended that *p* must be the case, or (b) merely associatively moves, without reasoning, to the latter occurrent awareness, directly from one's apprehension of X. Thus, to perceive something external to one's activity of perceiving does not depend on, among other things, having awareness of something existing or transpiring within that perceptual activity (cf. Reed, 1996a, p. 25).

## Inefficacious "Virtual Objects"

*Perceiving Pictures*

Under the heading of the "virtual," Gibson includes — although not exclusively — those many real or imaginary objects, places, events, and persons that one experiences by visually perceiving something else, that is, by visually perceiving *pictures* of them. Gibson (1979/1986, p. 63) describes the visual experience that one has in looking at a picture of something as being a "secondhand" experience of that something. The original observer who created the picture may well have had firsthand experience of the item that is depicted in the picture. Such experience can be said to "mediate" the experience of any other observer who later has the opportunity to look at the picture.

Surely, one can also rightly say: the activity of looking at a picture also yields *firsthand* experience of something, namely, of the picture itself. Not all of our visual experience that occurs in looking at a picture is of the "mediated" kind in Gibson's sense. With reference to firsthand and secondhand experiences, we commonly distinguish between, for example, perceiving a painting itself hanging in a museum and perceiving a reproduction of the same painting in a catalogue or book.

It would seem to be Gibson's view that anything of which there can be a picture can serve as a perceived "virtual object," that is, if (a) a picture of the item somehow comes into existence and (b) this picture is visually perceived so that the perceiver has visual experience of the item that is pictured therein. It is not enough that the picture be perceived. For example, there must also be sufficient light reflected from its surface so that the item portrayed can also be visually experienced. Otherwise, this item, not being experienced, is not a "virtual object." In contrast, the same item may be an actual object whether or not it is perceived.

From Gibson's (1979/1986) substantial chapter concerning "Pictures and Visual Awareness," the following paragraph is quite relevant:

> What are we to call the tree in the photograph, or the bleeding heart in an inkblot? Neither is an object in my terminology. I am tempted to call them *virtual objects*. They are not perceived, and yet they are perceived. The duality of the information in the array is what causes the dual experience. We need to understand the apprehension of virtual objects and, of course, virtual places, events, and persons. We can only do so in connection with the perceiving of real surfaces of the environment, including the picture surfaces. Note that our distinction between *virtual* and *real* will have to be independent of the distinction in classical optics between virtual and real *images*, which is swamped in epistemological confusion. (p. 283)

Gibson should not be accused of himself falling into such confusion on the grounds that he describes the tree and the bleeding heart as being both, at

the same time, *perceived* and *not perceived*. Although his statement does bespeak of complication, he is not thereby committing any kind of self-contradiction. For there are two different senses of the word *perceived* at work in Gibson's statement, as I spell out in the following two subsections.

*1. Depicted Objects Are Perceived*

"*Experience*." When a perceiver looks at the mentioned photograph and inkblot, there may be produced in the perceiver's visual system *experiences*, or *apprehensions*, of a tree "in" the photograph and of a bleeding heart "in" the inkblot. If the photograph is not a very bad one, as we say, the great majority of human perceivers will have visual experiences of a tree when looking at the photograph in good light. In contrast, a bleeding heart will be experienced less reliably even when the inkblot at which perceivers are looking makes such visual experiences likely. In either case, there does not appear to be good reason for us to refuse to speak of "experiencing" a tree or of "experiencing" a bleeding heart — just as there is no good reason for us to resist saying that, sometimes, people undergo experiences of insects as part of an hallucinatory episode.

In explaining his "new notion of perception," Gibson (1979/1986) describes perceiving as "an experiencing of things rather than a having of experiences" (p. 239). I take him thereby to be saying two things:

(a) Experiences are involved crucially in the process of perceiving.
(b) Those experiences that are therein involved, or some of them, are apprehensions, or awarenesses, of something beyond themselves.

Other theorists would put the latter point differently. For example, they would say: all or some experiences that are part of a process of perceiving possess, individually, the property of intentionality; they are each intrinsically such as to be *of* something else.

To speak in this way is not necessarily to imply that all things experienced — even when this experiencing occurs as a product and part of perceiving — are themselves there to be perceived. To say that someone "experiences" a tree or a bleeding heart is to classify the two visual experiences or two sets of such experiences as being of the one or of the other type. They are of the tree type or of the bleeding-heart type. All tree-type visual experiences are like visual experiences that one has as a product and part of visually perceiving a tree. An experience's type in this sense is determined by its own intrinsic properties, rather than depending on the stimulational presence or existence of a tree.

"*Awareness*." To refer to what he has in mind as regards how the visual system is psychologically affected when someone is perceiving a picture of something, Gibson (1979/1986, p. 262) makes use of another word, *aware-*

*ness*, in addition to *apprehension* and *experience*. He describes pictures as producing in their perceivers an awareness of things that are either imaginary, actual, or as yet nonexistent. Thus, a part of the activity or process of perceiving a picture is not only (a) having awareness of the picture itself, that is, the picture surface and its properties, but also (b) having awareness of the item or items of which the picture is a picture of.

"The viewer cannot help but see both," Gibson (1979/1986, p. 282) states. However, it is possible under certain perceptual conditions for the viewer to fail to apprehend the picture surface and, consequently, to have awareness of what is depicted therein as though it were actually there. Gibson (1979/1986) expresses disbelief regarding the reality of the latter phenomenon — except under the following combined perceptual conditions: a fixed point of observation, a constricted field of view, with only one eye deployed. It is just a myth, Gibson claims, that certain works of art can successfully "fool the eye" (e.g., *trompe l'oeil* paintings), so that, for example, one perceptually takes a bowl of fruit to be there before one's eyes where there is only a picture. Along with being visually aware of the "virtual" bowl of fruit, one cannot normally help apprehending as well the picture as such. It is not that the eye cannot be fooled — see, for example, the optical-tunnel experiment discussed in the next main section — but fooling the eye requires rare conditions, according to Gibson. Although this issue is worth mentioning, it does not have an immediate bearing on the present discussion.

*Perceiving and experiencing.* Consistently with Gibson's various analyses — though in contradiction of certain parts of Lombardo's (1987) extended interpretation of them (see Natsoulas, 1993) — I have distinguished between (a) the activity or process of visual perceiving and (b) its component stream of visual perceptual experience or awareness (Natsoulas, 1989b).[2] The total complex process of a perceiver's using his or her visual system to perceive something in the environment or of himself or herself in that environment includes, among its many other part processes, not only an obtained stimulus energy flux at the photoreceptors, but also *a stream of visual experience*, which proceeds at certain brain centers of the visual system. As Gibson (1979/1986, p. 240) holds, perceiving is a stream of "psychosomatic" activity, engaged in by a living observer, to which James's (1890/1950, Chapter IX) description of the stream of consciousness applies. James's well-known stream of consciousness consists of a succession of integral pulses of awareness, which individually can be very complex and have multiple objects (Natsoulas, 1992–1993). In grasping the relation between visual perceiving and its component stream

[2]Visual perceptual awarenesses are visual perceptual experiences and vice versa, in my view. Gibson would agree, as the above discussion in this main section of text indicates.

of visual experience, apprehension, or awareness, the following sentence from an earlier article of mine may be helpful: "Think of a total process that determines how its part processes unfold in time, while the part processes together in mutual integration, constitute the whole process and how specifically it proceeds" (Natsoulas, 1993, p. 251).

However, the perceiving of pictures complicates matters. "The process of object-perception is surely simpler than the process of picture-perception" (Gibson, 1951/1982, p. 310). Not only is more visually perceived than those parts of the environment and perceiver that are now giving one's field of view its specific photic structure; not only are more than the here-and-now-surfaces visually perceived, as is generally the case according to Gibson (see footnote 1 above). Also, in perceiving pictures, there takes place an extraordinary duality of perception: that is, there are normally two different kinds of visual experience or awareness involved in the visual perceiving of a single object when this object is a picture.

Distinguishing the two kinds of experience, Gibson would say that both firsthand and secondhand experience occurs at the same time when perceiving a picture (cf. Reed, 1996b, p. 3). Gibson states, "A picture requires two kinds of apprehension, a direct perceiving of the picture surface along with an indirect awareness of what it depicts" (Gibson, 1979/1986, p. 291). Both kinds of apprehension, direct and indirect, are parts of the visual experiential stream, which is — as is true in every other case of visual perceiving — a crucial component of perceiving a picture. Minus the experiential stream, the relation between the picture and the visual perceptual process would be *merely causal*, the picture contributing to the course that the process takes by how the picture structures the light it reflects to the individual's point of observation; all advertence to the picture or to the items it depicts would be missing from the process. (See the section in Natsoulas [1989b, pp. 54–57] titled "In the Absence of Visual Perceptual Experience.")

The component stream of visual experience, which is part of such episodes of perceiving, includes experiences that are of the picture and experiences that are of what is "in" the picture. And so, we may well seem justified in saying that an item "in" a picture is among the items that are perceived when one perceives a picture. This is what Gibson means when he says, speaking somewhat loosely, that a picture is both a scene and a surface. In the process of creating a picture, a surface has been physically modified or treated in such a way that, in addition, a certain scene is visually perceived when someone looks at the surface. A scene is visually perceived because the picture surface has been so treated as to reflect or transmit light in a spatial pattern that is like the pattern that the scene depicted would reflect if it existed, does reflect, or has reflected.

*Dual specification.* Moreover, the two kinds of experience which we have in looking at a picture are not associatively linked with each other; it is not as though one kind of experience, firsthand experience, somehow evokes or mediates the occurrence of the other kind of experience, secondhand experience. Rather, when one looks at a picture of something, the light which is thereby reflected into one's eyes from the picture surface possesses a spatiotemporal structure that includes two sets of informational invariants: (a) a set of invariants that is nomically specific to the picture surface and (b) another set of invariants that is nomically specific to the items which the picture depicts. Perceptual pickup of and resonance to both sets of invariants are essential parts of the process that produces dual visual experience as described above.

Dual informational specification is instantiated by a picture provided that the items that the picture depicts have existed, exist now, or will exist at some future time. Otherwise, there is no nomic relation of the above second kind, although all else may be just as though there is such a relation. Consider, for example, a highly realistic type of painting of an imaginary object. The light reflected from the surface of this painting does not specify an object that exists, other than the painting itself. Nor does it specify an object that does not exist; the relation of specification is a two-term relation, which requires the existence of both terms.

However, note Gibson's (1973/1982) statement:

> A good picture does not *have* to be in point-to-point correspondence with the facing surface of an actual concrete world (although a picture *can* be just such a projection and a photograph *is* one). It may specify a world that never was or, more exactly, the relevant features or affordances of an environment that is more interesting than any world that ever was. (p. 287)

This statement will seem to contradict what I have just stated. Gibson seems to be allowing pictures to specify the nonexistent. The word *specify* is the problem. It is being used by Gibson above as though it does not have reference to a relation, or to refer to a different relation than that of the specification of features of the environment and self. Perhaps, Gibson was thinking of the relation between how the picture surface affects the light and how the pickup of stimulus information affects the visual system. In that case, better to say: perceiving a picture sometimes includes as a part and product visual experiences of a world that never was and cannot be, as a result of how, specifically, the picture surface gives structure to the light it reflects into the eyes.

### *2. Depicted Objects Are Not Perceived*

When, as a part of the process of picture perceiving, one undergoes experiences (apprehensions, awarenesses) of the items which the picture depicts,

one is *not* perceiving the latter items themselves. The latter statement too is true in Gibson's view. Although Gibson's ecological science holds that both trees and bleeding hearts exist in the environment (no less so than the molecular and submolecular items of physical science; see Natsoulas, 1994a) — although both trees and bleeding hearts are environmental objects in Gibson's terminology — in looking at a photograph or an inkblot, what is visually perceived is not a tree or a bleeding heart. Although the experiences one has of the tree "in" the picture and the bleeding heart "in" the inkblot are categorically visual experiences and are certainly produced, no less so than one's visual experiences of the picture surface, as a direct, here and now consequence of photic stimulation, the experiences nevertheless belong under the heading of "indirect" or "secondhand"; for they are "mediated" by the stimulation to which the picture surface, not the item pictured, gives structure.

Whatever one may be having only "indirect awareness" of cannot qualify as something that one is perceiving, whether or not this awareness is directly produced by a process of perceiving. The reason for drawing the perceptual line in this way, as Gibson does, would seem to be that the tree "in" the photograph and the bleeding heart "in" the inkblot are not in fact themselves literally in the picture. They are not themselves actually there to be perceived in the immediate environment. They themselves are not giving structure to the light arriving at the perceiver's point of observation.

"The experience obtained by [means of] a picture is *as if* one were confronted with a material layout of light-reflecting surfaces but only *as if*" (Gibson, 1971/1982, p. 281). In contrast, the involved photograph and inkblot are indeed located in the immediate environment, they are actually there to be perceived, and they are themselves determining the structure of the light by which they are perceived. In contrast to what the picture depicts, a perceived picture is a surface belonging to that part of the environment which a perceiver of the picture occupies now. Gibson (1979/1986) goes so far as to say, "A picture can only be seen in a context of other nonpictorial surfaces" (p. 272).

Among the visual experiences (apprehensions, awarenesses) that are parts and products of visual perceiving, some may have as their objects items that one is not perceiving. Nor need any illusion be involved in order to have such indirect experiences as part of perceiving. For example, when one's experience of a tree is produced by perceiving a picture of a tree, one usually knows how one's present experience is being produced.

I do not mean to diminish those occasions on which one is mistaken regarding how one's visual experience is produced or those occasions on which one's knowledge of the latter just does not come to mind. Intently watching a movie, you may temporarily lose your bearings, so that you take

what is occurring in the film to be actually transpiring before your eyes here and now. I believe Gibson would want to say both of the following:

(a) You visually experience a scene in a movie when watching the latter but you do not thereby perceive the scene.
(b) The scene is no less "virtual" for your erroneously taking it to be there really before you; it does not shift ontological status from "virtual" to actual by being taken for an actual scene.

## Do Virtual Objects Exist?

In the preceding main section, I discussed Gibson's arresting statement that an object portrayed in a picture is both perceived and not perceived when one looks at the picture, and I have argued that this statement is not self-contradictory given the two senses of *perceived* at work in his statement. But the fact remains that, in several contexts, Gibson (1979/1986) speaks of virtual objects as being visually perceived. Gibson might be implying, in some if not all of these contexts, that virtual objects have some sort of positive ontological status. As I have already suggested, the latter does not accord with the remainder of Gibson's account of visual perceiving. In the present section, I argue against the visual perceiving of virtual objects with special reference to several instances in which Gibson maintains that one or another such object is visually perceived.

In a paragraph that I quoted earlier, Gibson (1979/1986, p. 283) refers to "our distinction between *virtual* and *real*." I agree with what he says there: psychologists of perception need to get this distinction right. In my view, *there are no virtual objects that are not also actual objects*. That is, no merely virtual objects exist. When Gibson speaks of something as "virtual," he does not necessarily succeed in referring to anything real besides the perceiver and his or her experiences. He succeeds only when what he is referring to as "virtual" is a real part (past, present, or future) of the environment or body. Think of any item that Gibson would call "virtual," for example, any one of the six items that are enumerated and successively discussed below. Either the item was, is, or will be an actual part of the physical world or the item has no existence.

There is no other alternative unless one takes the radical and perilous theoretical step of positing a distinct phenomenal world for each individual. Then, all items experienced by an individual that are not part of the real world would inhabit, purportedly, his or her phenomenal world, which is private and distinct from the real world. Compare this with Koffka's (1935) distinction between the behavioral environment and the geographical environment. The behavioral environment is the kind of subjective world, or world of consciousness, that psychologists are sometimes tempted to posit

regardless of the intractable theoretical problems this creates (Natsoulas, 1994a).

Perhaps all items experienced by the individual would be held — along with Koffka, and Köhler (1947), among other psychologists — to be denizens of the individual's private world. I have elsewhere considered critically the existence of phenomenal objects and environments (Natsoulas, 1980, 1994b). And, interestingly enough, the illustrious founder of the phenomenological movement, too, has rejected their existence, on highly cogent grounds (Husserl, 1900/1970, e.g., pp. 593–594, 1913/1983, e.g., pp. 92–93, 219; cf. Hintikka, 1995, p. 103).

With reference to the ontological status of virtual objects, I next consider in turn the tree in a photograph, the bleeding heart in an inkblot, and five other kinds of virtual objects that are mentioned by Gibson (1979/1986). Although I continue to phrase my points in terms of what is visually experienced, rather than what is visually perceived, I shall again come to the question, on which I have already commented from Gibson's perspective, of whether a tree, for example, is itself visually perceived when we look at a photograph of it. Let me introduce my position quite briefly as follows:

> Is not watching a documentary film about the Guggenheim Museum one way in which this museum is itself visually perceived? Following Gibson, Reed (1988) stated, "The information displayed by a picture surface can be of the same kind as that displayed by a real scene, but it cannot be a real scene" (p. 249). However, quite clearly, neither can the information projected by a real scene be a real scene. The distinction needs emphasis between (a) the physical, stimulational presence of an object itself and (b) the presence in the light of information which specifies that object. Perceiving depends on the latter more proximately than it depends on the former. Therefore, why should an object's physical presence in relation to our visual system be required for us to be said visually to perceive the object? Looking up into the sky, do we not visually perceive both extant and no longer extant stars?

### *1. Tree in Photograph*

From the perspective of ecological perception theory, what is or should be the ontological status of the tree that one visually experiences when one looks at a photograph of a tree? Does one thereby visually experience a real tree, a virtual tree, or no tree at all? I have already given reason to think that my own answer, which follows, is not the one that Gibson would give.

I am at the moment holding a photograph of a tree in my hand and looking at it. If a colleague of mine enters my office and looks over my shoulder, it would be quite natural for him or her to ask me to identify the particular tree in the photograph: *Which tree is that?* I would answer that it is a tree on the far side of the quad, growing directly in front of the main entrance to Galileo Hall. I might add — by way inviting theoretical discussion — that

the tree in the photograph is *none other than* the tree which I photographed this morning to produce this photograph.

Would this be a correct reply to my colleague's question? I have no doubts that it would be because I took and developed the photograph myself. Sometimes, in looking at a picture, what one visually experiences is an artificial tree, used on the stage or as part of Christmas decorations. But that is not the case this time; I can attest to the facts of the matter myself.

Now, suppose my colleague and I walk across the quad, hold up the photograph next to the tree whose photograph it is, and look at the tree and the photograph at the same time. Neither of us will have thereby an experience of two different trees, the actual tree and a virtual tree. Rather, we will visually experience the actual tree both as it is now and was then, when I photographed it. We will have visual experience of the one tree twice, somewhat as though it were two trees. Our visual experiences will be somewhat like those that occur in "seeing double." In the latter case, the temptation may be to say that we visually perceive two scenes before our eyes side by side. But, quite obviously, there is only one scene there before us that we can be visually perceiving. And, surely, there is no place else where two identical scenes exist.

*2. Bleeding Heart in Inkblot*

A tree pictured in a photograph is an actual object, or at least it existed at the time when it was photographed. But a bleeding heart in an inkblot is not an actual object. Although a bleeding heart can be part of the ecological environment, the ontological status of the particular bleeding heart in the inkblot is no different from the ontological status of an hallucinatory fire-breathing dragon. The bleeding heart that is visually experienced in looking at an inkblot does not exist, and has never existed, no matter how vividly it is now being experienced. Parts of the environment or body cannot be brought into existence by having experience of them. Indeed, the environment remains unaffected in any direct way by one's having experiences of it.

*3. Very Small and Very Distant Surfaces*

Referring again to something as "virtual," Gibson (1979/1986, p. 259) himself this time surrounds the word with quotation marks. He states that, when one places one's eye at the eyepiece of a telescope or microscope, the surfaces visually perceived through the instrument are "'virtual' instead of 'real,' but only in the special sense that they are very much closer to the observer" (p. 259). This statement would seem simply to mean: we perceive, albeit somewhat erroneously, the surfaces of very distant or very small bodies

when an instrument adequately magnifies the light projecting to our point of observation from those surfaces.

However, Gibson characterizes the visual perceptual activity that is involved in looking through a microscope or telescope as a kind of "knowing" that is distinct from perceiving. It is a kind of "knowing" that is, he states, "almost like seeing." Elsewhere, Gibson (1977/1982) briefly discusses this kind of perceptual activity and describes it as amounting to "more or less direct perception." The reason he considers such perceptual activity to be not quite direct is because (a) the respective instrument has modified the light reaching the point of observation and (b) perceiving the target (e.g., the moon's surface) therefore requires a small degree of "interpretation," rather than none at all.

Now, I would suggest otherwise: it is our knowing about the target, not our visually perceiving it, that depends in such cases on some interpretation. Indeed, the surfaces perceived are not actually as near to us as they appear to be through a telescope or microscope. But it is no less the surfaces themselves that are visually perceived. Similarly, most eyeglasses magnify or minify somewhat the light that passes through them into our eyes. However, what we visually perceive when we put our eyeglasses on is a part of our environment (and self), not virtual objects. Given the right prescription, we visually perceive the environment better with our glasses than without them, although objects may look closer or farther away than actually they are.

*4. Optical Tunnel*

Gibson (1979/1986) begins discussion of his optical-tunnel research (Gibson, Purdy, and Lawrence, 1955) with the following sentence: "In the next experiment, a surface may be nonexistent but may be perceived if it is specified" (p. 153). This "pseudosurface," this purportedly perceived nonexistent surface which Gibson calls an "optical tunnel," is not material or substantial, he states; rather, it is a surface *produced by the light entering the eye*.

A painting often specifies a nonexistent surface but, as we have already seen, Gibson would not unproblematically say that a nonexistent surface is perceived when one looks at the painting. Perhaps, in the optical-tunnel case, Gibson allows himself to speak unqualifiedly of the perceiving of a virtual object because he and his colleagues, by means of their experimental display, succeeded in visually fooling the observers who reported on their experiences of it. No informational invariants present in the light reaching the eye from the display specified how the observers' visual experiences of a tunnel were actually produced.

This perceived "pseudosurface" is properly described as a virtual tunnel, Gibson adds, but it does not qualify as a real tunnel. The light is what brings

about the optical tunnel, which does not exist out there in the environment among the surfaces reflecting light into the eye. In my view, the light does nothing remotely like produce any kind of tunnel. How could it do so? Of course, no optical tunnel actually comes into existence in the eye. Owing to the pattern of light that the experimenters have caused to be projected to the perceiver's point of observation, the visual experiencing of an optical tunnel takes place in the brain, but there is no optical tunnel at that inner location either. Compare with the tree in the photograph: Gibson would not say the light that the photograph reflects into the eye produces therein or anywhere else a "pseudotree" which is perceived. In both cases, a very different event takes place: light is artificially so structured that it makes possible visual perceptual experience of an object that is not there or anywhere.

*5. Shadows*

Gibson (1979/1986) would seem to hold that, when we look at a shadow which is cast on a wall by an object, we may visually perceive a virtual object that does not exist. For he states, "Beginning with the Chinese shadow plays in antiquity, moving shadows have been cast on a screen to induce perception of moving objects or persons" (p. 172). A light source radiates light onto a wall or screen in a partially occluded way, so that the light that is reaching the eye from the wall or screen possesses a spatiotemporal structure that resembles the pattern which would be directly projected to the eye by an object.

However, note again, the information contained in the light cannot specify properties of a merely virtual object because the latter does not exist and cannot serve as the second-term in the specification relation (cf. earlier subsection titled "Dual Specification"). If the photic array determined by a shadow does specify something other than the shadow, this something must be something actual.

In some cases, perceptual illusions will occur. Looking at a shadow, one may have visual experience of an object that is not in fact there. So too, one may visually experience a bleeding heart in an inkblot, but it is the inkblot itself that is visually perceived. Like an inkblot, a shadow may itself be perceived, but also a shadow may allow the visual perceiving of a particular one of its causes.

By looking at the shadow of an object, one can visually perceive properties of that object. For example, one can see it move and how it is moving. It might be preferred to say that one sees the shadow moving and infers from what one sees that a certain object is moving. However, a perceiver can easily come to ignore the shadow. More accurately, he or she may stop being

aware of the shadow as such, and become aware of it instead as the object, as though the shadow were the object.

This is not an inferential psychological process but a visual perceptual taking of the shadow for something else, namely, the object casting the shadow. Similarly, at dusk, you may visually take a juniper bush located at a distance from you to be a man who is standing there and waving his arm at you (Reichenbach, 1938, p. 198). You visually perceive the bush throughout, until you come sufficiently close to it. The perceptual conditions happen to be such, at this time of day, that you are aware of the bush as a man who in fact does not exist there or anywhere else.

An important disanalogy between the latter example and visually perceiving an actual object through its shadow is that the shadow may be taken for the actual object now determining properties of the shadow. For example, one may see a woman who is actually waving when all that one is able to see of her at the moment is her shadow.

But Gibson (1979/1986) states, "The visual solid angle of the shadow surrounded by light constitutes information for perceiving an object on an empty background, that is, a virtual object seen as if against the sky" (p. 172). The "virtual object" that Gibson has in mind here is not the shadow itself. He is commenting on the case in which a shadow is being cast on a transluscent screen from the other side of the screen by an object that the observer cannot see. When the shadow caster is moved away or toward the screen, what the observer is said visually to perceive as moving behind the screen is something else, a virtual object, neither the shadow nor the shadow caster.

The two motions, the actual and the experienced, proceed in inverse directions, toward and away from the observer, although of course they mutually correspond. What is visually perceived to be moving is not the shadow on the screen — which, if it is noticed as such, is seen to expand or contract in area. These changes in the size of the shadow are not illusory, and depend on whether the shadow occludes more or less of the light coming to the screen from a point source of light.

The temptation Gibson succumbs to when he speaks in this case of visually perceiving a "virtual object" diminishes as the spatiotemporal structure of the light reflected by the screen or wall or passing through the translucent screen is made more like the photic structure which the object casting the shadow would itself directly project. The degree of resemblance may reach a point where it is more natural to say that one sees the shadow caster than that one sees a virtual object (cf. the sixth subsection below).

*6. Invisibly Supported Object*

I return now to the invisibly supported object which I mentioned early in this article. Gibson's (1979/1986) figure showing the physical arrangements in the experiment includes the following descriptive commentary:

> The real object is held up in the air by a hidden rod attached to a heavy base. The virtual object appears to be resting on the ground where the bottom edge of the real object hides the ground, so long as vision is monocular and frozen. One sees a concave corner, not an occluding edge. Because the virtual object is at twice the distance of the real object, it is seen at twice the size. (p. 158)

There is an instructive difference between these sentences of his and Gibson's discussion of the experiment in the text. There is no mention in his discussion of anything virtual, nor of seeing anything virtual. Gibson's interpretation of his experiment does not require reference to a virtual object. Compare the above with the following sentences from the text, which are used to report the same finding:

> An observer who looks with one eye and a fixed head, through a peephole or with a biting board, gets an entirely different perception. A resting object is seen correctly, but a raised object is also seen to be resting on the surface. It is seen at the place where its edge hides the texture of the surface. It appears farther away and larger than it really is. (p. 151)

The figure, however, is a drawing that includes not only (a) a representation of the raised object in its relative physical position and size, but also (b) a labeled "virtual object" representing how the raised object looks to the observer under the experimental conditions. I believe this pictorial device, juxtaposing the real with the merely apparent, is what leads Gibson to state that the "virtual object" is seen. The diagram shows two objects. But there is in fact only one invisibly supported object, and two alternative ways in which it may appear to the observer depending on the perceptual conditions.

*7. Movie Scenes*

In his chapter on "Motion Pictures and Visual Awareness," Gibson (1979/1986) states, among much else, (a) that a motion picture is "composed of virtual events joined together" (p. 297) and (b) that the aim of filmic depiction is to produce in the perceiver awareness of a train of "virtual events" and their "causal structure" (p. 301). As will be seen in this section, my own view of motion pictures differs from Gibson's: their most basic contribution is, in my view, that they make it possible for us visually to perceive something that was earlier the case and took place somewhere.

There are, however, parts of Gibson's thinking on the topic of motion pictures that I do agree with. For example: (a) he describes what is projected on the screen as a temporally "progressive picture" made up of "transformations and modifications and nullifications and substitutions of [photic] structure along with deletions and accretions and slippage of [optical] texture" (p. 293). Also, (b) the "motions" of the projected pattern of light and shadow on the screen are *not* said, as one might expect, to show "virtual" items to the observer; rather, "they can show people, animals, objects, places, and events with the utmost precision and elaboration" (p. 293). The latter is well put and well taken. Any adequately sighted person can confirm the truth of Gibson's statement, and it is consistent with my position contra virtual objects. However, Gibson would not agree with me that the miracle of motion pictures allows us visually to perceive Charlie Chaplin himself, not a virtual person, doing an acrobatic dance long after his death.

Analogously to his analysis of still pictures, Gibson distinguishes between the treated surface (i.e., the motion-picture screen) and what the treatment — which consists, in this case, of projecting shadows onto the surface — shows to the perceiver. These shadows can produce very high quality information in the structure of the light reflected from the screen, information that is highly specific to things that are not themselves projecting light at present into the observer's eyes. Yet a motion picture is said to be made up of virtual events.

In what sense? On one obvious understanding of the latter phrase, not all motion pictures are composed of virtual events. Consider a simple and quite fundamental example: a hypothetical short film that consists of Charlie Chaplin on his own just performing a dance on roller skates. The film was easily made, in a single take, with a stationary camera occupying a fixed point of observation throughout. The film lasts roughly as long as the dancing did; it shows the performance from start to finish; and Chaplin is continuously in sight. Neither the motion picture itself, nor displaying it, nor watching it involves any virtual events. Some motion pictures are produced by combining pieces of film so that the perceiver can experience happenings that never have actually occurred. But this particular motion picture is completely unedited except for the choice of where it begins and where it ends, how much before the dancing starts and how much after the dancing ends.

I suppose someone can say that the film extracts the dance from its context, that is, from what came before and after the performance in Charlie's day. But such "extraction" is very common in ordinary visual perceiving as our field of view changes with our movements through the environment. Or it might be argued: the perceiver cannot orient himself or herself to the larger environment that surrounds the part of it which the movie shows. The latter is a far less common natural occurrence, but something essentially like

it takes place when a kidnap victim or an experimental subject is blindfolded and then circuitously transported to a distant windowless room. If the room is lighted, visual perceiving goes on as soon as the blindfold is removed, without the individual's knowing where he or she has been taken.

Is this Chaplin short in some other sense composed of virtual events? Chaplin performed the dance in character — but that does not make what we visually perceive a virtual dance any more than the original photographer of the performance saw a virtual dance. What we visually perceive now, as we watch the movie, is a performance that took place many years ago — but the information that specifies the performance has been preserved on film in such a way that makes it possible for us to see the performance time after time.

Compare this with the transmission of music not simply through the air but by means of radio. You do not need to be in the concert hall, or nearby to it, in order to hear the music that an orchestra is producing there. The informational features that the air in the concert hall instatiates as the orchestra plays are very largely preserved all along the way from the concert stage to the point where they reach your ears. Do you hear a virtual orchestra producing virtual music, simply because the air which the orchestra most proximately causes to vibrate in a special way is other than the air that fills your room? As it would be, too, if you were listening to the music in a room adjoining the concert hall. *What matters to whether you are hearing the music being produced in the concert hall would seem to be not your spatial proximity to the orchestra but whether the orchestra somehow — it does not matter how — causes the air in your room to vibrate much as it is vibrating in the concert hall.* It does not matter if the orchestra's playing affects your hearing after a slight delay owing to radio transmission, nor if it affects your hearing years later by means of a recording made that evening in the concert hall. In either case, it is that same evening's performance that you hear.

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