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## Representation Of, Representation As

The most naïve view of representation might perhaps be put something like this: "A represents B if and only if A appreciably resembles B". Vestiges of this view, with assorted refinements, persist in most writing on representation. Yet more error could hardly be compressed into so short a formula. (Goodman 1976: 3-4)

Nelson Goodman was quite right to say so. The budget of examples and counter-examples that prove it—we will look at some below—have largely been with us since almost the beginning of philosophy. But there ~~must be a reason if the idea he disparages, that resemblance is crucial to representation, is so persistently seductive.~~ That perfect likeness is an ideal pursued in visual imagery, at least, has much historical support. Pliny described the painter Zeuxis' grapes as so lifelike that birds tried to eat them—while Zeuxis in turn was fooled by Parrhasios who painted a curtain with such trompe l'oeil perfection that Zeuxis asked him to pull the curtain aside in order to show his painting.<sup>1</sup> We can cite the art of our time as well: hyperrealism in recent painting, such as Donald Jacot's or Jacques Bodin's, is surely admired in part for excellence of that kind. So while representation cannot be equated with the presentation of a likeness, and resemblance to what is represented is not crucial to representation as such, resemblance does play a role inviting our attention.

## The value of distortion<sup>2</sup>

That even visual, pictorial or plastic, representation is not a matter of producing accurate 'copies' exactly like their originals is already clear in Plato's dialogues.

Socrates and his young students once had a visitor from Elea whom they invited to take over Socrates' usual role in their ongoing seminar. The visitor agreed, choosing Theaetetus as interlocutor, and soon has him tied in knots on the subject of representation. There are real things, says the Eleatic Stranger, and there are images of real things—some are artifacts like paintings or sculptures, others natural like dreams, shadows, or reflections (*Sophist* 265e–266d). Aren't these images copies of what they are images of?

Theaetetus had already expressed a view on copy-making: "What in the world would we say a copy is, sir, except something that's made similar to a true thing and is another thing that's like it?" (*Sophist* 239d–240a). But does that apply to images in general? The Stranger reminds him that a sculptor may need to *distort* in order to represent something successfully. To make an exact likeness with respect to shape would require preserving the proportions of length, breadth, and depth of the original, and the colors of the parts as well. Those who sculpt or draw very large works don't do that: "If they reproduced the true proportions . . . , the upper parts would appear smaller than they should, and the lower parts would appear larger, because we see the upper parts from farther away. . . ." (*Sophist* 235d–236a).

We may wonder whether Plato is referring to actual examples generally discussed in Athens. There is a story, though its provenance not entirely clear, related by Ernst Gombrich, concerning two sculptors of the fifth century BC:

The Athenians intending to consecrate an excellent image of Minerva upon a high pillar, set Phidias and Alcamenes to work, meaning to chuse the better of the two. Alcamenes being nothing at all skilled in Geometry and in the Optickes made the goddesse wonderfull faire to the eye of them that saw her hard by. Phidias on the contrary . . . did consider that the whole shape of his image should change according to the height of the appointed place, and therefore made her lips wide open, her nose somewhat out of order and all the rest accordingly . . . when these two images were afterwards brought to light and compared, Phidias was in great danger to have been stoned by the whole multitude, until the statues were at

length set on high. For Alcamenes his sweet and diligent strokes being drowned, and Phidias his disfigured and distorted hardnesse being vanished by the height of the place, made Alcamenes to be laughed at, and Phidias to be much more esteemed. (Gombrich 1960: 191)

As Roger Shepard (1990) has studied and richly illustrated in our own time, this point is general, and does not just apply to sculptors of images to be seen from below. Even in an ordinary drawing, if you want two differently oriented parallelograms to look congruent, you have to make one larger than the other.

It seems then that distortion, infidelity, lack of resemblance in some respect, may in general be crucial to the success of a representation.<sup>3</sup> This does not rule out that resemblance in some other respect may be required. Yet even when that is the case—and it may be a special case—the *choice* of those respects in which resemblance or a specific kind of distortion is required, and those for which just anything at all will do, will have to be seen as crucial as well.

There must be a cautionary tale here for how we are to understand scientific representation. It may be natural to take a successful representation to be a likeness of what it represents—but much hinges here on what the criteria of success were when it was made. One sort of success is precisely what Copernicus was taken to have as against Ptolemy: that his theory displayed the real structure of the cosmos.<sup>4</sup> In general though, can we infer from success of a representation, in respects that we can directly appreciate, to the conclusion that it bears a structural resemblance to what is represented? The examples of how distortion may be crucial to successful representation (in view of the purpose of the representing) should certainly give us pause. But now we are running ahead of the story.

### *Caricature and misrepresentation*

Successful representation may require deliberate departures from resemblance. It does not follow that likeness will always be irrelevant to successful representation. Certainly the Eleatic Stranger's example does not show that, since even the sculptor of statues placed on high must ensure resemblance in some respect.

But now consider another side to the role of distortion. *Misrepresentation* is a species of representation after all: a caricature of Mrs. Thatcher may

misrepresent her as draconian, but it certainly does represent her, and not her sister or her pet dragon or whatever else she may have. Yet even if we take the caricature to represent her because of some carefully introduced resemblance there, we can declare it a misrepresentation by insisting that it represents her *as something she is not*. A caricature may represent a rather tall man as short (as a well known cartoon depicts Supreme Court Justice Clarence Thomas as very small compared to the chair he occupies), but it represents that man, and not someone that it resembles more as to height. A caricature misrepresents on purpose, to convey a message that is clear enough in context but is to be gleaned in a quite indirect fashion. My two examples are both visual representations, but they are not visually accurate, nor does their visual inaccuracy serve to produce a visually accurate appearance to a properly placed eye (as in the Sophist's sculptor's case), and yet, neither is their inaccuracy accidental.<sup>5</sup>

So distortion—departure from resemblance—which may be crucial to accurate representation in certain cases, is in other cases the vehicle of effective misrepresentation. Resemblance in some particular respect may be the vehicle of reference: we recognize the caricature as being of Mrs. Thatcher because of resemblance in certain respects. It may also be the means of attribution or misattribution of some characteristic: we take the caricature to represent her as draconian because of some likeness to a dragon, which is actually an unlikeness to her. *She is represented, and she is represented as thus or so*: the drawing is of her, and depicts her as thus or so.<sup>6</sup> But a list of likenesses and unlikenesses does not tell us this much—why, for example, is this not a caricature of a dragon as Thatcherian?

Let us look at another drawing, say, Spott's drawing of Bismarck as a peacock.<sup>7</sup> Is this drawing a misrepresentation? There we broach a question of truth that certainly is not settled in terms of visual accuracy or inaccuracy—even if both reference and attribution were effected by selective uses of resemblance and non-resemblance. The judgment whether this is an illuminating caricature that conveys a truth about him, or amounts to a falsehood, a lie, a misrepresentation, is not settled by geometrical relations between the line drawing and Bismarck's appearance to the eye.

If we just focus on resemblance in some respect as the core notion in representation then it is at best puzzling that distortion might be needed for effective representation. But if the resemblances are just a means to an

end there is no puzzle. The sculptor wants the object he makes to have a certain use, and he chooses the way in which the proportions of the object are related to those of the original—the ways in which they are like *and the ways in which they are unlike*—so as make that use possible. There have (of course!) been efforts aimed at naturalizing representation, such as Fred Dretske's account of information-bearing as correlation, but these tend to founder specifically on the issue of misrepresentation.<sup>8</sup> *Misrepresentation is a species of representation*. If the relationship 'X represents Y' were to lie in a ~~resemblance or correlation or other such structural relation between the two~~, what would misrepresentation be?

Suppose I say that the caricature that depicts Mrs. T as draconian misrepresents her. Then my assertion has as first part that it *does* represent Mrs. T as draconian, but as second part not only that it is unlike her with respect to shape, but that it depicts her as something she is not. To say that it misrepresents her with respect to shape is to say that rather than resembling her it depicts her as resembling (being like) something which, according to me, she is not like. To say that it is a caricature, however, is to say that it purveys an *interpretative attribute*, something that the picture can convey only by drawing on a social context, not just on what is 'in' the picture taken by itself.

So what is accuracy? The evaluation of a representation as accurate or inaccurate is highly context-dependent. A subway map, for example, is typically not to scale, but only shows topological structure. Relative to its typical use and our typical need, it is accurate; with a change in use or need, it would at once have to be classified as inaccurate. Similarly, in one political context, or relative to a certain kind of evaluation, a caricature may rightly be judged to be accurate, in another misleading or blatantly false.

### How does a representation represent?

We confront here the general question of how an item such as a picture can correctly represent, misrepresent, caricature, flatter, or revile its subject. Note well that the answer will not be also an answer to the question of what *representation* is. The question here addressed arises rather if we take it for granted that something is playing the representational role, and want to know just how it plays that role.

Nelson Goodman's *Languages of Art*, the twentieth century's seminal text on the matter, characterizes even pictures as being like statements, depicting a subject (the referent) as thus or so (as with a predicate).<sup>9</sup> By drawing the of/as distinction I was already more or less following him in this view. That something is a picture of Bismarck does not imply that Bismarck was in every respect the way he looks in the picture, it does depict Bismarck *as thus or so*. Goodman translates this into: *Depiction is [also] predication*. Since pictures denote things they are, in that respect, like names; but since they depict those things as thus or so, they are also predicates applied to what they denote. The content of this picture is the same sort of thing—or should be talked about in the same sort of way—as the content of a predicate or a sentence applying a predicate to the subject of that painting. To say that X represents Y as F, that is taken to have as guiding example something like

“Snow is white” represents snow as colored

Putting these two points together it seems quite apt to liken a picture to a sentence, rather than to either a name or a predicate. For in a sentence we typically also see a subject to which a predicate is being applied—the subject may be real enough, but it may or may not be correctly characterized. If the sentence is complex, we may distinguish respects in which the predication is accurate and ways in which it is not, just as we do with a painting.

Denotation, as Goodman understands it, is of something real, and the relation is extensional. Pictorial predication need meet neither of the conditions placed on denotation. If the painting depicts Thackeray as the author of *Waverley* we cannot infer that *Waverley* exists, nor that it had a single author if it does. But in addition, if Scott is the author of *Waverley* we cannot even say that the painting depicts Thackeray as Scott, except as a joke. Neither “predicates” nor “depicts as” is an extensional term.<sup>10</sup>

Goodman's most controversial thesis is that denotation and predication are also in the case of pictures entirely independent of each other. “The denotation of a picture no more determines its kind”, he writes, “than the kind of picture determines its denotation”.<sup>11</sup> (He uses the “kind” terminology to distinguish pictures that predicate differently.) This thesis is controversial since it is hard to accept that a picture could fail to convey anything correct or true about something and still be a picture of that thing.<sup>12</sup> Instead, we would typically think that we can identify what it is a

picture of by looking at how things are depicted in it! But there are limiting cases where this can be drawn into doubt.<sup>13</sup>

Undeniably, though, Goodman has brought into the limelight the strong analogy: a picture is a picture of something, and depicts that something *as thus or so*, and so is in that respect similar to how a verbal description is a description of something, and describes that something *as being thus or so*. We need now to see how we can go beyond this analogy.

One way in which Goodman did bring in resemblance was through the intricate notion of *exemplification*. If a hardware store clerk or interior decorator shows you color swatches or fabric samples, those exemplify the property of interest in the following sense: they both *have* and *refer to* that property (Goodman 1976: 45–68 ; Elgin 1996: 171–83). Obviously their use is to represent to you what your wall or floor will look like if you choose the corresponding paint or carpet. Representation by exemplification involves likeness, but much more than likeness. In these examples visual resemblance plays a role: in fact, the color swatch has the same color, and in that crucial respect resembles, the paint that it represents to the customer. This only works if the relevant visual resemblance is *highlighted* in some way, has a status unlike that of the many other resemblances—that is the point of taking exemplification of the relevant property, rather than mere instantiation, as the vehicle by which representation is achieved.<sup>14</sup> The relevant visual resemblance must be *highlighted* in some way in that context, so as to bestow that status—here we have strayed from semantics into pragmatics.

But do not equate even this beautifully articulated relationship with picturing or imaging! As Goodman later pointed out, the word “word”<sup>12</sup> both refers to and has the property of being a word, so it exemplifies that property, but is not a picture or image. (Goodman 1987–8: 419)

#### *Asymmetry of representation*

There is an asymmetry in representation that resemblance does not have. This is a much repeated point, made to show that resemblance is not the right criterion for representation. Resemblance could not be the crucial clue to representation, it is said, for even if representation did require resemblance to its target, the target would then resemble its representation but not represent it. While resemblance is indeed not the right criterion, the argument from asymmetry is not all that strong.

First of all, we do tend to use terms like “resemble” and “looks like” and such asymmetrically in certain contexts, because the subject of a statement tends to select the focus or contrast. Of Rosemary’s baby they said “He has his father’s eyes”. Hard to think of their saying about the father “He has his baby’s eyes”. The retort may be that *literally* the noticed resemblance goes both ways; but “literally” may here just mean “if you ignore the context”. Probably we can find a context in which someone may, without oddity, assert not that a given picture is an exact likeness of me but that I am its exact likeness, or something to that effect. But that would not show that *resembles* is symmetric in general, let alone in every context in which it comes in.

That *literally* resemblance must go both ways—that *literally* speaking it is both reflexive and symmetric, while representation is neither—is most likely based on the simple idea that to resemble (in some respect) is to have a property (of the pertinent kind) in common. But that is too simplistic a construal anyway. The production of a photo involves a ‘collapsing’ of shades of color and of three-dimensional spatial structure into two dimensions. If that counts as pertinent resemblance, then this is a relation of *homomorphism* rather than *isomorphism*, yet central to modeling. That A is a homomorphic image of B certainly does not entail that B is that of A.<sup>15</sup>

But this contrary point too is weaker than it seems. If A is a homomorphic image of B then there is a reduction of B, ~~modulo some equivalence~~ relation, to which A is isomorphic—so we might say that *in this respect* B resembles A just as A resembles B. So there is no strong argument, as far as I can see, based on any clear asymmetry to banish resemblance from our topic, nor one to make it relevant to representation in general. What does remain, as needs to be emphasized, is that certain modes or forms of representation (but not all) do trade on *selective* (and not arbitrary) resemblances for their effect, efficacy, and usefulness, and that this typically goes in one direction only.

#### *Resemblance in discord with representation*

In examples of picturing, of visual representation, resemblance tends to spring to the eye. Both reference and attribution can be achieved in other ways, however, even in visual representation, rather than by means of carefully selected resemblances. And conversely, even there, what is represented, and how it is represented, cannot in general be deduced simply by

attending to resemblances and non-resemblances. To show this, Goodman mentions the painting of the Duke of Wellington which everyone agreed resembled the Duke’s brother much better.

Socrates argues the point by means of a look at the extreme case, where the resemblance is greatest, in his discussion with Cratylus about verbal representation:

I quite agree with you [Cratylus] that words should as far as possible resemble things, but I fear that this dragging in of resemblance . . . is a shabby thing, which has to be supplemented by the mechanical aid of convention with a view to correctness. (*Cratylus* 435c)

Socrates’ thought experiment leading to this remark has a quite contemporary ring, if we replace gods (as is usual now) with mad scientists. In his discussion with Cratylus, correctness and accuracy are being characterized in terms of greater resemblance:

[ . . . ] in pictures you may either give all the appropriate colors and figures, or you may not give them all—some may be wanting—or there may be too many or too much—may there not?

[ . . . ] And he who gives all gives a perfect picture or figure, and he who takes away or adds also gives a picture or figure, but not a good one. (*Cratylus* 431c)

Here the “mere resemblance” view of representation appears on Socrates’ lips, somewhat surprisingly; but Socrates himself will soon put us right on this. When Cratylus draws the parallel with language too simplemindedly, the discussion immediately shifts into a subtler gear. Socrates replies, in partial contradiction to the above:

[ . . . ] I should say rather that the image, if expressing in every point the entire reality, would no longer be an image.

Let us suppose the existence of two objects. One of them shall be Cratylus, and the other the image of Cratylus, and we will suppose, further, that some god makes not only a representation such as a painter would make of your outward form and color, but also creates an inward organization like yours, having the same warmth and softness, and into this infuses motion, and soul, and mind, such as you have, and in a word copies all your qualities, and places them by you in another form. Would you say this was Cratylus and the image of Cratylus, or that there were two Cratyluses?

*Cratylus* I should say there were two Cratyluses.

*Socrates* Then you see, my friend, that we must find some other principle of truth in images. . . . Do you not perceive that images are very far from having qualities which are the exact counterpart of the realities which they represent? (*Cratylus* 432a–d)

That Cratylus does not grant that the copy, made by the god to duplicate Cratylus entirely, is an image of Cratylus shows at the very least that resemblance is not sufficient to make for representation. But the example shows much more—we need to explore it in detail.

### What's in a photo?

Just to assert of something that it is a representation, or that it represents, or that it represents something, is woefully elliptic and invites obscurity and confusion. Our full locution must in the general case be *at least* of form “X represents Y as F”, as in “the caricature represents (depicts) Mrs. Thatcher as draconian”.<sup>16</sup> Here X is a representation, Y its referent, and F a predicate that X depicts Y as instantiating. The “as . . .” locution is fascinating, a difficult topic in the analysis of language, and we will need to carefully distinguish how its intensionality is connected with the relationality and intentionality of representation. But this form too is still too brief to allow all needed distinctions.

Why didn't Cratylus agree that the god would have made an image of him? The god would, in Socrates' example, have made a perfect replica, more perfect than any statue made by a human sculptor. The replica would certainly, if properly displayed, have created the appearance of Cratylus' being there. So as far as the later classification in the *Sophist* goes, the god would have acted both as likeness-maker and as appearance-creator. Yet Cratylus demurs: the god would not have made an image of him but would have made ‘another Cratylus’. What are we to make of this intuition?

A more contemporary example will show the inherent ambiguity in play here about what represents what, with what, and to whom. Imagine: I have acquired a famous photograph of the Eiffel Tower, *Au Pont de l'Alma* by Doisneau. It hangs on my wall, but I scan it and print the scanned image. This print is an image too—*what does it represent?* The Eiffel Tower seen from the Pont de l'Alma, or the famous photograph?

There is no single immediately and obviously right answer; there couldn't be. It depends on what I do with the thing. If I send it to you from Paris as a postcard, with the single note “Wish you were here!”, then it is itself a photo of the Eiffel Tower. If I insert it into the book I am writing about photography, then it represents the famous photo by Doisneau. There are still other possibilities.<sup>17</sup> In other words, if it is an image of something at all then *what it is an image of* depends on the use, on *what I use it to represent*. So the question *what does it represent?* must in this case be taken as elliptic for *what is it being used to represent?*

This term “use” can assimilate “make” and “take”: the caricaturist *made* the caricature to depict Mrs. Thatcher as draconian while I, seeing the caricature, *take* it to depict Mrs. Thatcher as draconian, and *display* it to you so as to depict her to you as draconian. There may also be a disparity: the boy in William Golding's *Free Fall* made drawings of hills and forests but his teacher takes the drawings as pornographic. All of this falls under “use” in the general sense in which we say that in pragmatics we are meant to study the relation not just of symbols to things, but the three-term relation between symbol, user, and thing. Our fuller locution—shortened in different ways depending on what is taken for granted in context—must be “Z uses X to depict Y as F”.<sup>18</sup>

I have put this in individualistic terms: you or I can use something **to represent something, though of course to communicate or convey anything at all that way—be it factual information, feeling, intention, or command—we must let each other in on how something is being represented.** (As Goodman put it, the most probative question is not *what is art?* but *when is art?*) Since communication presupposes community to some significant extent, this will be possible only in a context where some modes of representation are already held and understood in common. Within discussions in which the institutionalization of relevant symbolry is already taken for granted, the point about use may be put in terms of *function* or *role*. And although these terms make sense also for an individual creation of a symbol, the role will generally be one specifiable within a manifold of roles, a ‘system of representation’, a ‘language of art’. Thus Ned Block writes

What *any* representation represents, and *how* it represents . . . depends on the system of representation within which it functions. (Block 1983: 511)

My point is not just that what represents what is relative to a system of representation. Rather my point is that you can't tell for sure whether you are looking at a representation at all *just* by looking. . . . One has to determine how the thing functions. (Ibid.: 512)<sup>19</sup>

Relativity to systems, 'languages', recalls Goodman of course; and this applies very well to pictures, as is well enough understood when different styles of representation are studied.<sup>20</sup>

This notion of system, or of function if understood as a role in a system, sounds still quite impersonal, but we must understand it in terms of pragmatics, referring to contexts of use, broadly construed. The context-sensitivity does not go away when (in different ways) Nelson Goodman and Ned Block say that you need to know which *system of representation* the item belongs to. For since the same item will in different contexts belong to different such systems, we then need the relevant contextual factors which determine *that*.

What is really to be emphasized here is the way in which individuals and groups, though relying on some pre-existing communally understood form of representation (a universal qualification of all communal activity), create new representations and new modes of representation. When Descartes created his method of coordinates, it is not as if he was just using an already extant way of representing spatial shapes and motion. But it is true that in his initiative, to use known numerical equations in this way, he bestowed a role on already familiar equations that they had not had before. Unlike a moment's poetic depiction quickly lost to history, this act engendered a mode of representation fundamental to all subsequent science.

### What is a representation then?

Look back now at Socrates, Cratylus, and the god they imagine. Did the god make an image of Cratylus or did he not make a representation of anything, but a clone? That depends. Cratylus was too hasty in his response! Did this god go on to display what he made to the Olympic throng as a perfect image of Greek manhood? Or did he display it as an example of his prowess at creature-making? Or did he do neither, but press the replica into personal service, since he couldn't have Cratylus himself?

What is represented, and how it is represented, is not determined by the colors, lines, shapes in the representing object alone. Whether or not A represents B, and whether or not it represents the represented item as C, depends largely, and sometimes only, *on the way in which A is being used*. "Use" must here be understood to encompass many contextual factors: the intention of the creator, the coding conventions extant in the community, the way in which an audience or viewer takes it, the ways in which the representing object is displayed, and so forth. To understand representation we must therefore look to the practice of representing, to how representation is a matter of use; and this involves attention first of all to the users in a broad sense of "use". That is the main thing to be concluded both from our discussion of caricature and misrepresentation, and from the Cratylus and Eiffel Tower photo examples.

*There is no representation except in the sense that some things are used, made, or taken, to represent some things as thus or so.*

I do not advocate a theory of representation, and this could not possibly be offered as such since that would be circular. But if I did, I think this would be its *Hauptsatz*.<sup>21</sup>

What does this exclude from the category of representations? That depends of course on precisely what "used, made, or taken" means. And that in turn depends on what is required if this *Hauptsatz* is to solve or dissolve puzzles about representation. (For example, the puzzles that result if one begins with the thought that resemblances—likenesses, correlations—will determine, by themselves, what the representor represents.) What we can conclude, at least, is that *use*, in the appropriate sense, must determine the selection of likenesses and unlikenesses which may, in their different ways, play a role in determining what the thing is a representation of, and how it represents that. Moreover, the selection cannot be mute: in the pertinent context, this selection and the precise role it plays, the selection must be salient, so the use must be such as to *highlight* that selection.<sup>22</sup>

The use is what bestows the relevant role or function on the item used. There are uses of the terms "use", "make", "take" which imply no intentionality: the car uses gasoline, the tornado took the life of my neighbor, the Ice Age glaciers made these valleys. But our puzzles about what representation is do not disappear unless "use" and its cognates are understood here in the sense in which they presuppose intentional activity.

That said, I will just write “use” for *use*, *make*, or *take* understood in this sense.

If that *Hauptsatz* is understood in this sense, then it places some immediate limits on the range of representation. Firstly, at least if taken entirely literally, it has no room for the notion of mental images or mental representations, whether taken to be brain states or something more ephemeral—for no such things, if they exist at all, are *used* or *put to use*, or *taken* in one way or another.<sup>23</sup> At least, not in the relevant sense: we can conceive of a brain surgeon bestowing a representational role on the patients’ brain states, but not of a person bestowing roles on his or her own brain states—or, presumably, on whatever could count as mental states.<sup>24</sup>

Secondly, this conception leaves no room for ‘representation in nature’, in the sense of ‘naturally produced’ representations that have nothing to do with conscious or cognitive activity or communication. The Eleatic Stranger gave a whole series of examples of copies, but it is not clear that they are all images in the sense of representations:

Things in dreams, and appearances that arise by themselves during the day. They’re shadows when darkness appears in firelight, and they’re reflections when a thing’s own light and the light of something else come together around bright, smooth surfaces and produce an appearance that looks the reverse of the way the thing looks from straight ahead. [...] **And what about human expertise? We say housebuilding makes a house itself and drawing makes a different one, like a human dream made for people who are awake.** (*Sophist* 266c–d)

Most shadows and reflections that occur in nature are not being used or taken, let alone made, by anyone to do anything. (The Balinese shadow puppet theater is an exception.) So by our *Hauptsatz*, they are generally not representations. Nor is the track left in sand by an ant in some desert long, long ago in a galaxy far, far away. . . . not even if it has the shape of our word “Coca Cola”.<sup>25</sup>

A black mark on a rock does not refer, represent, or mean anything unless it has a role, or has bestowed on it a role, in some practice—no matter whether it is a simple stroke or a complex pattern. Nor is it sufficient that it has the sort of shape, coloring, etc. that *would* place it in a certain role if encountered or produced in a certain cultural context, by persons belonging or assimilated there, if *in fact* it does not bear any relation to such a context.

But a natural object can represent, just as it can play other roles, namely if we bestow such a role on it. Imagine I am using a stone, found on the ground, to hammer in a tent peg. I am using it as a hammer—it is my hammer now, I have bestowed the hammer role on it. The hammers we buy, in contrast, are manufactured precisely to play this role—they are manufactured artifacts. The stone was not made for that, and it is not an object that I created, constructed, or assembled. Nevertheless it is now a physical object with a function—that is to say, an artifact. There is an analogy here to ‘objets trouvés’, natural objects ‘made’, without physical modification, into works of art. All of this applies *mutatis mutandis* when I use the stone to represent, for example, a certain statesman’s heart: I bestow a role on the stone for it to play, I give the stone a function for it to serve.

What is in a photo? What is in a picture? This question has the misleading form of “What is in a box?” We won’t get much further by taking this form at face value and giving an answer with the correlative form, such as “What is in the representation is its content”. That is just a verbal answer, conveying nothing by itself. *To call an object a picture at all is to relate it to use.*

As an analogous example we can think of Herbert Mead’s reflections on the teacup (McCarthy 1984). If there were no people there would be no teacups, even if there were teacup-shaped objects. For “there are teacups” implies “there are things used to drink tea from” which in turn implies “there are tea-drinkers”. **By ignoring the contextuality of representation, the fact that we are dealing with about-ness, and that what the representation is about is a function of its use, we could land ourselves in useless metaphysical byways.** If we were to ask “What is in a picture?” while taking the picture simply to be the ~~physical object and with no~~ relation to anything that can bestow meaning, the answer would have to be “Nothing!”

The notion of *use*, the emphasis on the pragmatics rather than syntax or semantics of representation in general, I will give pride of place in the understanding of scientific representation. But does that exclude too much? That a particular person at a specific time uses or takes or presents something to represent something else is a very local event. Could it really be a general condition on representation that something so specific has to happen? In a comment on similar “intentional” views of what constitutes representation, Mauricio Suarez suggests that it will hamstring the idea that theories represent:



on the intentional account of representation a theory cannot ‘represent’ a phenomenon that hasn’t been observed. For a theory cannot be intended for a phenomenon that hasn’t yet been established. (Suarez 1999: 82)<sup>26</sup>

The objection, if valid, would not just apply to a theory or a model, it would imply that nothing can be intended (let alone used) to represent something that has not entered our acquaintance, or something that we do not know to exist.

The objection is presumably not that there can’t be a representation of something that we have not already encountered. A meteorological model, found for example on a weather forecasting website, does in fact provide us with a representation—more or less accurate, or not accurate at all—of the weather in the next five or ten days. Is the objection then that we cannot be said to use or take or present this meteorological model to represent the coming week’s weather? But we do use it, and the viewers so take it. So could the objection rather be that this model could have been or provided such a representation although it could not have been—to use Suarez’s exact words—*intended for the actual meteorological phenomena, which are still in the future?* It does not seem so, it seems that it was intended precisely to represent those (as yet unknown) phenomena.

#### *Relation, intention, intension*

Representation is a *relational* notion, if we go by the form of assertions that attribute this status. “Tragedy is a representation of an action. . . .” Here is a painting of a picnic on the grass, the statue over there represents justice, that graph depicts the growth of a bacteria colony. In each case we have a subject term, a relational predicate, and a term for the second relatum.

But we are not dealing with something as simple as a relation of physical contact or impact or proximity. First of all, the second relatum may not be real. In fact, to say that something is a painting of a picnic does not at all imply that there is a real picnic which that painting depicts. “The *Mona Lisa* is a portrait of Mary Magdalene”: this assertion purports to mention two real things and a relationship between them. Perhaps it does. But the important point is that the form by itself cannot reveal this. For the assertion may be true still if it turns out that Mary Magdalene was not a real historical character. Even if she was, the *Mona Lisa* could at best depict how Da Vinci imagined her to be, which we can’t necessarily equate with depicting her.<sup>27</sup>

The “of” that marks the relation of representing object to what is represented is like the one familiar from Brentano’s characterization of mental acts as ‘directed’, *intentional*. Intentionality we also see in semantic discourse when we say that “Zeus” is the name of a god, for example. Representation is *intentional* in the sense of relating to epistemic intention, in the sense of being *about* something, in just the way that reference (by someone) and predication (by someone) are. But just as thought can be directed in this sense at what is not present, not experienced, not known, or even non-existent, so can any use of something to represent something. By so using it, the user bestows a role, the role of representing such and such as thus or so. If for example I draw a graph and present it as representing the rate of bacterial growth under certain conditions, then by virtue of that very act, what the graph represents is the bacterial growth rate under those conditions—period. It is equally apt to say that I represented that growth rate as thus or so—and it would be apt to say that if, instead of drawing the graph, I had displayed the equation of which the graphed function is a solution. And so forth, *mutatis mutandis*, for the case in which I display a function that has such graphs as output for inputs about ambient conditions of bacteria colonies, or state a theory that describes a family of such functions with a further free variable for the type of bacteria. . . .

Given this intentionality it is perhaps not surprising that in the case of representation, the relations can change with context of use. The very same object or shape can be used to represent different things in different contexts, and in other contexts not represent at all.<sup>28</sup>

The expression “A represents B” when used all by itself is misleading. It is easy to get into confusions when the relational character of a term is suppressed. To illustrate: every woman is a daughter and every daughter is a woman, so why is *being a daughter* not the same as *being a woman*? Precisely because to be a daughter is to be daughter of someone. Analogously, to represent something is to represent something as thus or so. The complexities appear in force when we extend these assertions to the three-place relation “A represents B as C”. Simone de Beauvoir depicted herself as a dutiful daughter, but not as a dutiful woman.<sup>29</sup> All and only creatures with hearts are creatures with kidneys—yet to represent something as having a heart is not the same as representing it as having kidneys. And so forth. This ‘opacity’, the resistance to substitutivity of identity, is a mark not only of the *intentionality* of thought, but of *intensionality* in discourse.<sup>30</sup>

We see this in modal contexts:  $9 =$  the number of planets, but it does not follow that the number of planets is necessarily greater than 7. Also in oratio obliqua: the mathematics teacher who taught us that  $7 < 9$  did not tell us that 7 is smaller than the number of planets.<sup>31</sup> Representation of an object as the evening star is an activity that is intentional, in the way that mental acts are traditionally said to be, precisely because to do so is not the same as representing it as the morning star—even though that is the very same object.

So assertions to the effect that something represents, are *intensional*. This is primarily a point about language, but is closely related to the point that representation itself (the activity) is *intentional*, both in Brentano's sense and in the common sense of the term.

Ordinary discourse does not mark the distinctions we are making here, or not very well. In analytic philosophy language has been regimented to some extent to do so. Thus "He said *of* Mrs. Thatcher *that* she was draconian" asserts a relation of the speaker to the real Mrs. Thatcher, while "He said *that* Mrs. Thatcher was draconian" does not, in this regimented form of discourse. If Mrs. Thatcher was the Prime Minister, the first sentence implies "He said of the Prime Minister that she was draconian" but the second does not imply that. The role here given to the "of" locution marks an artificial verbal distinction (even if not without roots in prior general usage), but such artifice can be useful when confusion threatens.<sup>32</sup>

Where do the intensionality and intentionality come from? To understand this is as important for representation in science as in the arts. The answer lies of course in our *Hauptsatz*, that *there is no representation except in the sense that some things are used, made, or taken, to represent some things as thus or so*. But even this does not suffice by itself, for it does not make explicit what all is involved in the *use*, by way of value, purpose, aim, and yes, intention. Ronald Giere spells this out concisely for scientific representation and one further contextual factor, purpose:

If we think of representation as a relationship, it should be a relationship with more than two components. One component should be the agents, the scientists who do the representing. Because scientists are *intentional* agents with goals and purposes I propose explicitly to provide a space for purposes in my understanding of representational practices in science. So we are looking at a relationship with roughly the following form: *S uses X to represent W for purposes P*. (Giere 2006: 60)

But the point is quite general. The spelling out can only go so far, because the notion of representing has (suffers from?) variable polyadicity: for every such specification we add there will be another one.

### Appearance to the intellect: illumination as *embedding*

We have been concentrating mainly on appearance to the senses, but when viewing a painting or movie, reading a story, or watching a computer simulation, we may well ask "I can see what is happening, but what is really going on?" Quite often however we do not even get to this question: our active, agile imaginations have already supplied, assumed, or conjectured a pattern behind the displayed events. On other occasions we press to find or construct a model in which the random or puzzling appearance is sublimated in a well-behaved structure, of which it is the surface. In such a case we arrive at a representation of the original as embedded in a larger whole, and thereby made to satisfy certain demands of the intellect.

There certainly are examples of this in the visual arts. A picture of an apparently levitating woman may be immediately recognizable as of the Virgin Mary because the figure's feet are on a crescent moon and she is surrounded by jubilant angels. The embedding structure presents the story in which the event is embedded. But something similar can be said of the event depicted in Jacques-Louis David's *Oath of the Horatii*, though it does not draw on such pervasively common knowledge. The lamentations of the seated women in the background show how much more is going on than the event depicted taken in itself; they help to give meaning to what is happening through an embedding in a larger story.<sup>33</sup>

But the most straightforward examples come from the history of modeling in mechanics. Think for a moment of a swinging pendulum. Determinism requires that if the same state occurs at different times, it is always followed by the same succeeding states. At its lowest point, the bob has its maximum speed—but location and speed can be the same at two different moments, and the location a moment later be different. If we keep only those two factors in our description, we have an apparent violation of determinism. The remedy is simple: enlarge the description by replacing speed by velocity, which is speed + direction. The velocity at

the lowest point is not always the same; when it is, so are the immediately succeeding locations.

All these features are still in the domain of kinematics. Descartes's famous aim for mechanics was that it should be deterministic but only have 'quantities of extension', that is, kinematic parameters. When Leibniz and Newton each came up with counter-examples, they also introduced new, non-kinematic (dynamic) parameters to "fill out the picture". The apparently indeterministic kinematic behavior is embedded in a model that has additional parameters—such as masses and forces—which is deterministic after all.

These examples provide the pattern for 'hidden variable' interpretations of apparent indeterminism. Reichenbach argued that such added parameters might not correspond to anything real, and that physics could forego satisfying the demand for determinism. But as a good empiricist, he offered this as methodological advice: neither demand them nor ban them from modeling. The touch stone would be the usefulness of such models for empirical prediction.

For us, the point here is simply that, for a given purpose, the best representation might well be one that embeds its target in a larger structure. So we can add *addition of 'surplus structure'* to distortion and the trading on selective **unlikenesses**, to our **catalogue of means for representation achieved by departures from mimesis**. Hence, again, there is **no universally valid inference** from what the best representation is like to what the represented is like.

### In conclusion

A scientific, technical, or artistic representation is an artifact. As such, it is both an object or event in nature, that we can regard purely through the physicist's or chemist's or mathematician's eyes. But it is at the same time something constituted as a cultural object, through its role or function, bestowed upon it in practice. Just what the representation is, or what is represented and how, is not determined entirely—and often enough, hardly at all—either by what is 'in' the natural object or by its physical or structural relations to other things.

When resemblance is the vehicle of representation, for example, the representation relation derives from selective resemblances and selective

non-resemblance, but what the selections are must be somehow highlighted. If the selection or the highlighting is indicated by signs placed in the artifact itself, these too need to be meaningful to play their role, and so the task of identification is pushed back but reappears as essentially unchanged.

Thus what determines the representation relationship, with all its polyadicity, can at best be a relation of *what is in it* to factors *neither in the artifact itself nor in what is being represented*. In the examples and puzzles here examined, the extra factors characterized use, practice, and context, and these form the proper basis for generalization there. That is not the end of the matter, representation is not to be subjected to definition: it is inexhaustible as a subject.

<sup>4</sup> See for instance the photo of Mars made through the Hubble telescope, at <http://www.jpl.nasa.gov/news/features.cfm?feature=533>. Ian Hacking has recently studied the use of such terms in the history of science, and has emphasized that the term “phenomenon” typically denotes things classed as remarkable, unusual, or amazing. What amazes are often individual occurrences but also often processes with many instances. Some of this appears in Hacking 2006 (see p. 32, section C1 “The creation of phenomena”) issued in connection with his Carl Friedrich von Weizsäcker-Vorlesungen, Hamburg 2007.

## 1. Representation Of, Representation As

<sup>1</sup> In Pliny the Elder’s *Natural History*, xxxv. Available on-line <http://www.perseus.tufts.edu/cgi-bin/ptext?doc=Perseus%3Atext%3A1999.02.0137&query=toc:head%3D%232431>

<sup>2</sup> For the point that many recent objections to ‘resemblance’ or ‘isomorphism’ views of representation (or as necessary and/or sufficient conditions for representation) were already offered in Plato’s *Sophist* and *Cratylus*, see my 2000b.

<sup>3</sup> Once the Eleatic Stranger’s point is appreciated, examples abound. A painting or drawing, however realistic, achieves its aim by means that are strictly different from what it is a ‘likeness’ of—think only of the cross-hatching to render shadows, or of the strokes of thick pigment in a fresco, noticeable when inspected from close up.

<sup>4</sup> We should add: ~~and that he had as well correctly spelled out the distorting relationship that produces quite different appearances to the astronomer’s eye~~

<sup>5</sup> The issue of misrepresentation, and how it requires adjusting any view of representation that trades on resemblance, is dealt with for the case of sculpture (but with farther reaching conclusions) by Hopkins 1994.

<sup>6</sup> For an exploration of how *representation-as* is crucial to how models in science represent what they model, see Hughes 1997 and my 1994.

<sup>7</sup> Reportedly in E. Spott, *Bismarck: A Book of Mistakes*. 1883; I have found no trace of this book.

<sup>8</sup> For an analysis of the difficulty see Harms 1998: 482, 485.

<sup>9</sup> For further development of Goodman’s view, with special application to scientific representation see Elgin 2006.

<sup>10</sup> I leave aside Goodman’s attempt to accommodate them somehow in extensional discourse.

<sup>11</sup> Goodman 1976: 26. This phrasing derives from his constant attempt to observe a strict nominalism: a depiction of Scott as wise he would call a “wise”-picture, and say that that was the *kind* of picture that it was.

<sup>12</sup> For a clear and balanced exposition of an alternative, including a defense of a moderate ‘resemblance’ view of pictorial content, see Files 1996.

<sup>13</sup> The main moral I want to draw is that this account is not far from the view that sentences and pictures have after all the same kind of thing as content: *propositions*, to use the common term for the content of a sentence. Goodman’s nominalism would of course stand in the way of this sort of formulation, but it can be construed innocuously, without violence to anti-ontological scruples.

<sup>14</sup> See further Elgin 2006, which explores this with special reference to scientific experimentation and models.

<sup>15</sup> Bartels 2006. These terms are also context-sensitive: an isomorphism is a one-to-one onto function that preserves “pertinent” structure, while a homomorphism is a many-to-one onto function that does so. The term “pertinent” gets its content from the context, where one sort of structure or another is under study.

<sup>16</sup> For the moment I am staying with representations of specific, real things; later we may have to look seriously at such examples as “X represents a man holding a candle/ Santa Claus delivering presents/phlogiston as escaping rapidly” and the like.

<sup>17</sup> “Once we take on board the distinction between bare bones and fleshed out content, we are in a position to notice an important feature of pictorial representations. In the late 70s, Sherry Levine produced a controversial series of photographs. She made photos of some Walker Evans photographs that were basically indistinguishable from Evans’ originals. This was controversial because ~~she displayed her photos as her own work. In a sense, they are her own work: she made photos of Evans’ photographs while Evans made photos of life in the rural United States. In another sense, their similarity to Evans’ originals makes them~~ seem like mere copies. Controversy aside, this sheds light on an interesting feature of pictures. Many different scenes, like a chair and a jumble of line segments, can result in the same kind of photograph or linear perspective picture from any given point of view. Levine’s photos show that one potential subject for any given picture is a plane that has shapes and colors indistinguishable from the picture itself. So, in a sense, the rural US, a well-designed Hollywood set, or simply a photo like Evans’s could result in a photo like Levine’s.” (John Kulvicki, “Any Way You Slice It: The Viewpoint Independence of Pictorial Content”, with comments by Dilworth, on <http://www.interdisciplines.org/artcognition/papers/9/version/original>).

<sup>18</sup> This form is still restricted; as we will see, it needs extra contextual parameters, such as the purpose for which the representation is made or which it is made to serve. That is especially relevant for scientific representation; see e.g. Giere 2006: 60.

<sup>19</sup> See further sections 3 and 4 of Schwartz 1980. That what makes something a representation is the fact that it is pressed into representational service by representation users is also a theme emphasized in Paul Teller's 2001a.

<sup>20</sup> The standard reference here is Hagen 1986.

<sup>21</sup> Compare Georgalis 2005: 128–9: "For any item *r* to represent a particular item *t*, there must be a *conscious agent s to whom r represents t*. I call this the *fundamental fact of representation*." My statement goes beyond this, since I imply that there is also a representing *by* (and not just *to*) an agent. However, there is a limiting case, in which one and the same agent plays both roles, for example when someone spontaneously takes an encountered natural object or event to represent something.

<sup>22</sup> cf. Georgalis 2005: 122: "Since there is no necessary connection between a physical item serving as a representation and that which it represents, *if the representation is to do its job*, . . . somehow the uniqueness of what is represented must be secured"—and see his pages 123–9 for where this point leads.

<sup>23</sup> I take this to be consonant with the literal use of "use". When we say that a car's engine uses gasoline there is no implication of agency or community, and perhaps one part of a brain could be said to use another in that sense. But I take those uses of "use" to be at best derivative from the literal use. The narrow concept of representation, due to that narrowly construed use of "use" will not, in my view, hamper our discussion of scientific representation.

<sup>24</sup> **The emphasis on use, as here understood, implies community:** there is no such thing as essentially private representation any more ~~than private language~~, except in the sense in which private uses can exist as derived from or parasitic on communal practices.

<sup>25</sup> The example is essentially Putnam's. As to the main point, the Eleatic Stranger has a line on this: he has prefaced the list by saying that he regards the natural ones as divine workmanship—so perhaps he thought of shadows as really made in order to represent the objects casting them. What about things in dreams? It's a nice conceit, that paintings are dreams made for people who are awake—a conceit echoed by the idea of films as dreams that money can buy, and indeed by the film "Dreams That Money Can Buy". But as an example to show that there are 'representations in nature' it begs the question of what dreams are.

<sup>26</sup> This is part of an objection to the semantic approach. Suarez takes that approach to involve a view of what representation is—mistakenly, in my opinion. In this paper he also refers to my view of representation as I presented it in my 2000b, but sees that as an addition to what he gleans from the semantic approach.

<sup>27</sup> Cf. Goodman 1968: 21–6. Since Goodman kept denotation at the heart of his account of representation, he devoted considerable attention to the case of

representations that do not represent real things, hence have nothing to denote. His gloss on this will do for our purposes.

<sup>28</sup> The term "relation" may in fact not be the most apt to explain intentionality. As Benoit 2006 emphasizes, Brentano who defines the intentionality of mental activity by the statement that it is characterized as such by "the relation to something as object" drew a distinction between this case and a genuine relation (which must be between real things), and says eventually that intentionality is not a relation but something relation-like: *kein Relatives, aber ein Relativliches*.

<sup>29</sup> In more linguistic terms, the context created by "represents" is 'referentially opaque', for the premise that *S* and *T* are the same or apply to the same things does not license the inference from "X represents Y as being *S*" to "X represents Y as being *T*".

<sup>30</sup> I use "intensional" for terms, expressions, forms of discourse, the criteria being essentially those discussed under this heading by Quine: opacity to reference, resistance to substitutivity of identicals, and so forth. See for instance *The University of Alberta Dictionary of Cognitive Science*, " 'Intentional' is not to be confused with 'intensional' spelled with an 's', the latter of which refers to the meaning of a term, (along with 'extensional')" (though that dictionary entry gives too narrow a meaning to "intentional"). For "intention" see Dennett and Haugeland 1987. For a metaphysical approach, of the sort that I contest here, see Zalta 1988.

<sup>31</sup> It is best and clearest to think of this as a point about language, displayed by focusing on what is and what is not to be inferred in particular examples. But the same examples, presented in the "material mode" (as Carnap would say) serve to make the point about what these assertions display as (putative) fact. I will not bother to obsessively distinguish formal and material mode.

<sup>32</sup> Note however that even the regimented verbal distinction does not hinge on the word "of" alone. "His speech included a description of Mrs. Thatcher as draconian" is not covered by the convention, it is still ambiguous in the usual way, and the substitution of "the then Prime Minister" might or might not change the truth-value of this sentence.

<sup>33</sup> In aesthetics, discernment of that level of meaning is the subject of iconography—see Panovsky, 1955: 26–54.

## 2. Imaging, Picturing, and Scaling

<sup>1</sup> Even in Goodman's theory, the important case of representation by exemplification hinges on a highlighted resemblance. The relevance of such sorts of representation for science as well as for art is strongly argued in French 2003.

<sup>2</sup> See especially Sellars 1965: 180–2.

# Scientific Representation: Paradoxes of Perspective

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