

Wayfinding: Notes on the ‘Public’ as Interactive

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Abstract “Public” is here treated by its three extensions: most broadly, from the merely extrasomatic, where users of representations are initially distinguished from makers, through ‘published’ or for the general public, to the governmental, official—where the discussion begins, before turning in its second half to the more common, middle meaning. What is public in these ways, “spatial representation”, also has the different meanings of representation of space or representation by spatial means, and there are several kinds of space to be considered. The styles of the two halves contrast, that of the first being an inductive mapping of neglected conceptual terrain of *directive* representations, that of the second linear: a continuous argument in answer to a question regarding *descriptive* spatial representation in the digital age. The common thread is the public as users of all such cognitive artifacts, and this use as interactive, with a range of implications for social collectivity.

“A user of each thing has most experience of it, so it is necessary that he tell the maker which of his products performs well or badly in use. Through having to listen to the one who knows, a maker has right opinion about whether something he makes is fine or bad. But the one who knows is the user.”—“Entirely, indeed.”¹

1 Res Publica

1.1 A Butterfly Effect

Plato got there first, this time with the idea of user testing. His was an ideal city; let us, too, approach our topic of public use with civic contexts, but actual ones, beginning with the far from ideal. Consider the spatial arrangement of the 2000 Palm Beach County, Florida Presidential “butterfly” ballot, where, for want of user testing, a

¹Plato, *Republic* X, 601de, author’s adjusted translation. Cp *Cratylus* 390.

designer's view failed to match that of many users, with grave consequences (Fig. 1). There a designer looked across facing pages of a ballot in bookfold symmetry, with shared punch-holes down a central (depressed) spine, while thousands of voters, with no motive to scan a ballot's full slate, looked for the two main choices atop the left-hand page (as in a normal book), missed the broad zigzag symmetry arrangement of choices, and so mistook the linear order of the holes down its center and apparent gutter, voting for a surprised #4 rather than a disappointed #5, thereby apparently deciding a national election and the course of recent world history.² If, as also conjectured, many were not guided by the arrowed ordinal arrangement of numerals (running 3–11, 13: officially redescribed as “the hole next to the arrow next to the number next to the candidate they wish to vote for”) partly owing to parallax on an obliquely presented surface with two levels, the spatial interest of the case increases. What usability testing might have revealed is the degree of fit between the spatial layout of a display and the likely spatial strategies of its users. This simple case ‘graphically’ demonstrates that the interactive is nothing new, but occurs whenever a visual information display is accessed by users who have not designed it themselves. That is the nature of public use.

1.2 Collectivity and Intentionality

So important, if neglected in current cognitive theory, is the broadly public use aspect of spatial representation that it merits general attention before considering kinds of representation. If our first case would win no prizes, to introduce more ideal examples, let us begin with one that did. A public, online site for all government services, ‘GOV.UK’, was unanimous winner of the London Design Museum’s 2013 ‘Design of the Year (Digital)’ award, as “simple, direct, well mannered”, and comprehensive.³ Although it, too, does not directly concern spatial representations, it introduces some of the most important of them: public wayfinding situations—literally in road travel, here figuratively in ‘navigation’ through government documents such as tax. Echoing Plato, the designers listed as their first principle: “Start with needs: the design process must start with identifying and thinking about real user needs. We should design around those [desire paths]—not around the way the ‘official process’ is at the moment”,⁴ thus expressing what psychology calls second-order intentionality, the ability to recognize and appreciate another’s point of view.

While psychology identifies the second order as distinctive to humans within their first year, it is not always to be taken for granted among adults, or governments.⁵ Indeed focus on public displays extends to a crucial third order of intentionality: that public users recognize that makers have their and other users’ points of view in mind in the design process and display. To an extent, this already holds for designs simply as artifacts, whereby they are understood as made by some to provide affordances (Gibson 1977) for others to reach specific goals. Thus each user conceives of a producer, in making the display, as conceiving of the user as a member of a group. The descriptions “well mannered” and “respectfully” reflect this. Of course public designs of any kind

² van Natta and Canedy 2000. Ironically, its designer, Theresa LePore, stated: “I was trying to make the print bigger so elderly people in Palm Beach County can read it.” She did not test it on them.

³ Design Museum. “Designs of the Year”, 2013 (taken down): <http://www.designsoftheyear.com/>

⁴ Government Digital Services (UK) principles: (<https://www.gov.uk/designprinciples>)

⁵ See Tomasello 1999, pp. 84f, Tomasello and Rakoczy 2003, Tomasello and Moll 2010

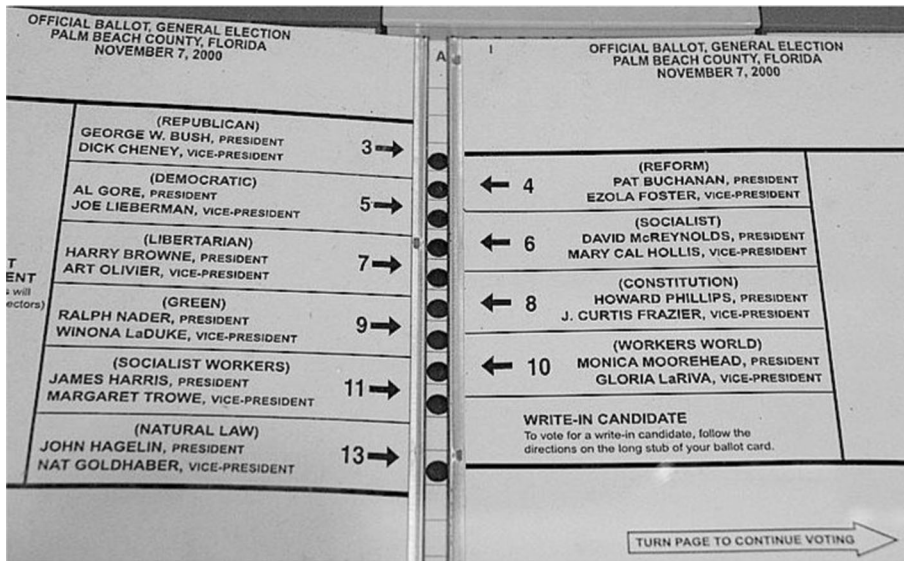


Fig. 1 Ballot, general election, palm beach County, Florida, 7 November 2000 (Gzuckier at the English language Wikipedia)

can be understood otherwise: as disregarding users' points of view or as burdening, confusing, frustrating, seeking to intimidate. It is normal for users to assume such intentions in the course of dealing with public displays, hence to make evaluative assessments of them as such.

1.2.1 Vertical and Horizontal Intentionality

The reciprocal structure allowed by a third intentional level may be important enough to merit comparison of two well-known but distinct theories of intentional awareness. On the one hand, there are theories, such as that of Robin Dunbar (2010, 2014), of the evolutionary importance of our ability to grasp nested levels of intentionality, as illustrated in his *Othello* example. In order to write effectively, Shakespeare must grasp what his audience will understand Iago to take Othello to suspect that Desdemona supposes that Cassio thinks. While this approach stresses 'mentalising' depth, primatologist Michael Tomasello's (1999) stresses breadth, a horizontal socialization out from the second order, which will become increasingly necessary for what is sometimes called 'social navigation'. On this view, "what makes us human" is our ability to understand that others—possibly many—share our attention to particular things and situations, some of which (notably artifacts) thereby acquire the "intentional affordance" properties of being for 'our' collective use, for common goals, as when a child asks what an artifact is by asking what it is *for* (for us).⁶ Applied to *Othello*, this

⁶ Dunbar's 'social brain' argument, based on *Homo sapiens*' need for cooperative action, should also be considered horizontally, as he does with his "Dunbar's numbers". Good hosts and good waiters require broad horizontal 'mentalizing' powers regarding guests. Yet, even this approach does not specifically represent ordinary intentional reciprocity, as in Patsy Kline's, "I know that someday you'll want me to want you". From Plato and Aristotle through Kant 1790, §43, artifacts were understood in yet another way, common to many cultures: in terms of art or craft, possibly implying a horizontal dimension at the maker level.

would be an audience member's sense not only of the fictional 'Machiavellian' intentional structure in the play, but of the likely actual awarenesses of the rest of the audience—even of those of Shakespeare's time, as well as others, past, present future—so that, as Kant (1790, §8) pointed out, we normally describe aspects of the work in “a universal voice”, enabling social enjoyments of discussion and criticism.

Theater also provides a useful way to contrast the present intentional reciprocity point with Dunbar's—while challenging his thesis that five levels is our normal cognitive range. For he appears to overlook that audience members know when they enter the theater that they are dealing with an artifact, and are therefore well aware of the minds of the playwright, actors and the rest of the theater production at work throughout, upon which all that other, fictive, 'mind reading' depends. And while Tomasello's joint-attention approach emphasizes this, not even his “triangle” of intentional artifact and mutually aware users (Tomasello 1999, p. 66) includes the maker, in the reciprocal relationship with those users sketched above.

By contrast, regarding at least certain officially public cases, such as the governmental, user-based reciprocity is sometimes even further emphasized with a political thesis that, combined with collective awareness, it may strengthen a sense of community among users, when, with common use, the point of view of not only oneself but of many others seems respectfully reflected in effective, shared public presentations. Such is at least a *spes* (hope) *publicum*.⁷ That the public needs good public services to remain a public may especially show when, as in our next two examples, the common spaces represented are not only physical but publicly regulated ones.

1.3 Underground

For specifically spatial representational displays, in the civic sense of “public”, the prize-winning government Digital Service cited as inspiration two well-known exemplars: Harry Beck's London Underground diagram and Jock Kinneir and Margaret Calvert's (K/C's) UK highway road and signage designs 30 years later. Let us take them in order. Beck's highly successful, internationally imitated ‘tube map’ might furnish a sufficient case-study resource for much of our topic (Fig. 2). Its many developments since 1933 are already subject of a considerable literature (e.g. Garland 1994, Fourthway (<http://www.fourthway.co.uk/realunderground/>), Guo 2011). Our brief remarks on it begin with the kinds of spaces represented. Despite some initial official skepticism, the Diagram's (as Beck preferred to call it) immediate public popularity, subsequent success (with millions of tourists among the Underground's current 1.25 billion rides yearly) and wide adaptation confirm some basic features of human wayfinding representations, notably, our ability to navigate the topological spaces of connectivity orders (continuity of path usually reflected in continuity of mark) without much geometric mapping. Since the ordinal is assumed by the succeeding measures of interval, ratio and metric—also since spatial (as well as temporal) continuity is basic to our sense of substances (including our own bodies)—that should not have been very unsurprising.

This is confirmed by the weakly public—that is, barely extrasomatic—roughly diagrammatic and, more commonly, verbal, local directional instructions we produce

⁷ The phrase “collective identity and common purpose” is due to a proponent of such views regarding “civic community”, Tony Judt, as in his last writings: Judt 2009; 2010.

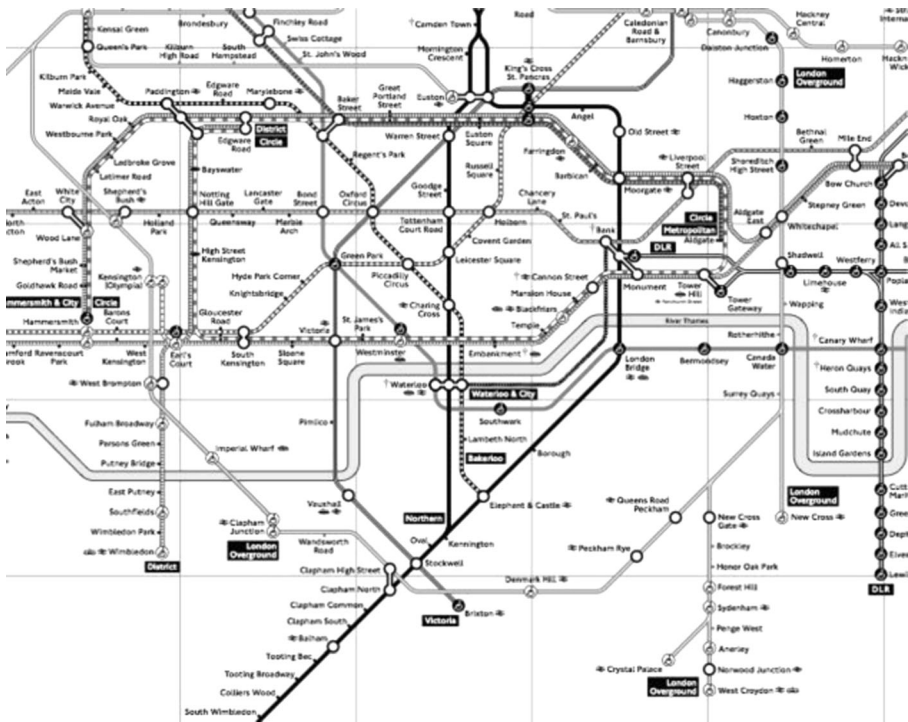


Fig. 2 London tube map, central detail. Transport for London

for friends or strangers, which take similar forms of path continuity (“straight ahead, then left at the second turning”), even regarding officially public spaces. Such artifacts are highly contextual, ad hoc communications within small groups, usually supplemented with other signs, including speech, gesture, bodily orientation, facial expressions—some indexical, in the sense of taking meaning only within the actual spaces they represent. Their mixed nature extends into their more strictly spatially graphic aspects. For while being predominantly topological, like the tube maps, they are typically hybrid—that is, set within general geographic and geometrical frames (their sketching often accompanied by apologies in that regard).

1.3.1 The Hybrid Norm

These ad hoc, everyday examples help distinguish the three kinds of space in the more officially public tube maps, whose representation is basically topological, while showing a maplike surface feature—a schematic Thames—in addition to overall compass orientation, even where the latter cannot be preserved locally. Regarding its underlying geometrical grid, our ad hoc cases also make clearer the Diagram’s ‘syntactic’ and ‘semantic’ double meaning, since its many versions have had to address a user-based design requirement of clear, even distribution of information over small rectangular sheets. While detail maps provide ancillary spin-offs, this is especially necessary for public transit diagrams, which must allow users to scan whole systems in order to explore alternative routes.

Accordingly, Beck could use straight (colored) lines for routes between stations, with only 90-, 45- (thus 135-) degree turns summarizing the compass direction changes that develop his Diagram across 2D surfaces, and neglect scale, entailing famous paradoxes regarding proximities of stations (notably for Wimbledon). This makes user-sense: since someone else is doing the driving, we can focus on making our connections. Ensuing ‘semantic’ complications due to continual growth of the system has entailed gradual adjustments to that basic plan. Such user-necessitated geometric and geographic inflections of topological diagrams reveal another point: that pragmatic issues not only inflect but may trump those of syntax and semantics. First, to consider a few cases (easily found online), Beckian variants have proved successful for the distinctly 45° *Métro de Paris* diagram (with its firm, schematic river), Moscow Metro (octopus-like from a central circle and lightly indicated river), Rome’s ‘X marks the spot’ little system and more elaborate *Ferrovie Regionali*, Delhi Metro (with river), Tokyo’s awful Suica-Pasmo and other system diagrams—even Transit for LA buses.

However, since information resides in differences, we should also consult the New York City MTA’s elegant ‘art nouveau’ whiplash-tendrils design, where Beck’s approach was rejected by riders, reportedly due to its incongruity with their firm mental—that is, not public—maps of the simple aboveground grid of ordinally arranged (numbered, not named) streets and avenues, which also, unlike London, most subway tracks shadow (Rawsthorn 2012). This introduces another important kind of ‘interactive’ space for considering public spatial representations—a nonpublic kind that regular users carry with them: their mental mappings of their own life spaces. The latter are of course affected by the former, thus a presumed cause of the tube map’s popularity is that it provided for the first time a practical kind of overall grasp of “a disorderly, disjointed accumulation of urban villages” (Garland 1994, p. 7) for which London cabbies’ wayfinding powers are legendary.

1.4 On the “Plain Public Road”

Our second ideal case (“a role model for modern road signage all over the world”), the K/C “system of ... coordinated lettering, colours, shapes and symbols” (Design Museum), in a mix of letterfont, nonfigurative, but heavily pictogrammic markings, is a convenient place to bring up an important point, which applies to the previous examples.⁸

Guided by Kinneir’s user-based question, “What do I want to know, trying to read a sign at speed?”, this is a paradigm of visual design (including the artist Calvert’s close attention to the negative spaces surrounding the marks: Fig. 3). Yet, despite common practice of calling many spatially graphic signs and representations, public or not, “visual”—thus the literatures on visual thinking, visual proofs, visualizing information—we have avoided that term so far, since our previous examples have not been necessarily visual. Indeed it is high time to emphasize that many need to be accessed by visually impaired users. Spatial signs for—including representations of—spaces need

⁸ A paradigm of this essay’s emphasis on (user-based) design in the context of information displays—and therefore of the mixing of cognitive modes—is K/C’s shrewd (and at first controversial) use of Calvert’s *lower case*, curved, sans serif ‘Transport’ typeface for placenames on signs (Fig. 3, h), which allows easier recognition of names by their top shapes. (The GOV.UK site digitized Transport and adopted it for onscreen use, too, in their prizewinning 2012 reconfiguration.)

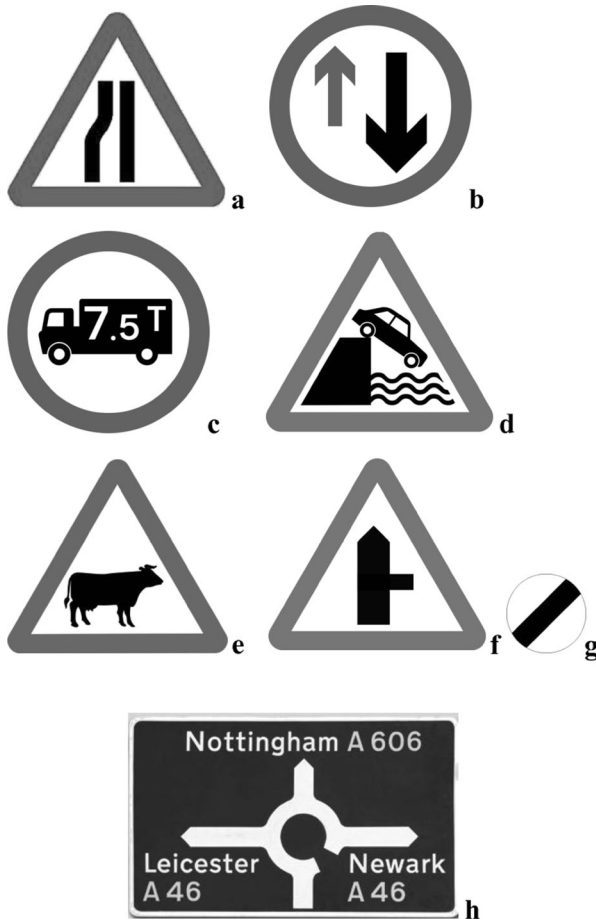


Fig. 3 UK traffic signs. (Note break in ring in h.)

not be visual, and we should in general beware a tendency to confuse sense access to cognition with cognition itself.⁹ This discussion introduces the visual only when it becomes essential to user-descriptions, as with road signs.

1.4.1 'Located' Signs

Traffic signage brings forward another important, seriously overlooked point regarding public, spatial, representational displays and spaces. Since, strictly, "wayfinding" might mean "consistent use and organization of definite sensory cues from the external environment" for "all free-moving life" (TfL), road and highway examples caution us about a gratuitous picture of spatial representations: of cognitive artifacts that function detached, even remote, from what they

⁹ See Oliver Sacks 2008, 2010, 2013. Helen Keller's writing had already raised questions, now pursued by medicine, as to whether sensory processing parts of the nervous system may continue to function in people with diminished or lost use of corresponding organs.

allegedly ‘refer to’. This prevalent conception was expressed by psychologist William H. Ittelson (1996), in terms of “markings [that] are on the surface but not of the surface”, or, very generally, “designs, writings, diagrams, depictions” and so forth that “appear on a surface, but ... do not refer to the surface—their information content is ‘decoupled’ from its real-world source”, since such a mark has “nothing to do with the state of the immediate present world from which it comes” (p. 171). This ‘reference’ function is commonly thought of as a pointing to something else, as usually shown with arrows.

Recently the ‘release from proximity’ function of markings¹⁰—notably the representational—that Ittelson describes is receiving increased attention in sciences that converge on a better understanding of human consciousness. It is certainly a feature of our tube maps and of many road signs, where travelers need to know in advance what is coming, especially at speed, where there are choices. Yet we need not question its importance when we note that, regarding marked signs generally, it does not hold for the lines we cut or fold along, measuring marks on rulers and on measuring cups, and so forth. It does not even hold for ubiquitous arrows of orientation, such as those that go with “this side up”. The point about orientation is fundamental, as now we are doing the driving. Creatures bilaterally symmetrical, thus of a beginning (head), middle and end, and thereby able to move ahead, detection of headings—even when we do not know where we are—is a basic egocentric spatial guide.¹¹

A compass illustrates this. It consist of three moveable pointers, one controlled by a magnetic pole of Earth, which is aligned with a second compass point, the third by the user’s setting along an elected heading (‘bearing’), with a scale for reading the output: the resulting angle between the second and third. Saying that the first arrow points to the magnetic pole is a loose way of saying that it points in the direction of that pole, compasses (like weather vanes) not being for pointing to distant things, but rather for showing directions, notably headings, even when we do not align them ‘indexically’ with maps, knowing where we are. The same holds for most arrowed road-direction signs, which show road headings at locations without even compass directions. Far from pointing to our destinations, these may change, even reverse, their directions over short spaces.

1.4.2 Waymarking

Regarding the indexical ‘you are here’ aspects of maps (the GPS of it), important features of signs emerge from emphasis on present orientation and location. From ancient times, wayfinding has produced a kind of waysigning: waymarking. The latter’s likely source would be animal and human tracks and trails as mere facture: traces of movement paths, produced inadvertently, with no reference to later perception. Use of such natural signs would promote purposeful modulations for easier future use, by the track-makers and others, which would, in turn, promote the sort of intentional reciprocity in §1.2: those

¹⁰ With apologies for adaptation of this phrase from its meaning regarding face-to-face communication, as in Gamble 1998.

¹¹ Thus a current, at least heuristic, hypothesis of relatively separate ‘where’ and ‘what’ (dorsal and ventral) cortical information pathways in our brains, the ‘where’ being rooted in our current location, with ‘indexical’ functions (e.g. Goodale et al. 2006).

done for later notice by oneself or others—and noticed as being done for that very purpose, at least. Many a familiar space-indicating sign (for example, road-surface markings, including lane lines and directional arrows) is 'located' by being embedded in its object, where it functions by drawing our attention to certain aspects of the very "state of the immediately present world from which it comes" (Fig. 4). This is by modulating the object's appearance to us. Such signs are truly 'indexical', if not entirely in the linguist's, in the etymologically more general, sense of announcing something. Perhaps surprisingly, apt comparison to them may be found in 'located' decorative markings on people and their artifacts—streamlines, for example. Such markings, as Susanne Langer (1957) reminded us, function not only as ornaments, but by making their bearers in certain ways "more visible", to encourage, also to shape and vivify our perception of them, as being what they are—including, as on much pottery, main axes, shapes, parts and functions (p. 61). Regarding prehistorical origins of the great "decoupled" class of marked signs, a 'Just-So Story' might be that, for memory, a sequence of 'located' markings on a way might have been recorded in an ordered fashion on a single, portable, object.

1.5 Location, 'Located', Place

With mention of indexical functions, discussion of located signs brings our inductive course sufficiently parallel to linguistic theories that we should pause to consider whether they merge. "A stop sign", Ruth Millikan 2012 writes,

is placed just before the place at which one is to stop. Where [it] is placed signifies where to stop. The complete sign consists not just in a sign saying "stop" but in its standing in a certain place. Subtracting the place, the bare sign does not signify anything. So it seems that not only can an object ... become incorporated into a sign and made to stand for itself, a place can be incorporated into a sign and made to stand for itself (p. 221).

It seems that the two accounts meet, yet, coming from different directions, the linguistic begins with the sign into which it seeks to incorporate the place,



Fig. 4 Urban road traffic markings (London, Islington). Seven kinds of markings, some qualifying others. Photo: Patrick Maynard

whereas our spatial design approach begins with the place, whose spaces it seeks to make more perspicuous through markings in it. Here Millikan's (2012) linguistically-based comparisons of way and other signs with indexicals, demonstratives and (intermodal) anaphora may prove illuminating. There is room for only two points on her views, of contrast then comparison. First, since Millikan's inclusion of 'the signified' not only within sign situations but within the signs themselves is universal, it would not correspond to the idea of 'located' signs as one kind. Also, as, within the context of public spatial representations, that idea was introduced by contrast with the prevailing "markings ... on the surface but not of the surface" idea, we have traveled lightly, even without the term "reference", in considering it. By contrast Millikan's linguistic context includes the doubles, sign/signified, referrer/referent, label/labeled, standing for and so forth. Not only are we, in a graphic design context, avoiding dualistic beginning-points, it is doubtful that they would apply to most of the way-signing mentioned. While all such are reasonably termed 'signs' and clearly have significance, it seems misleading to think of them (for example, road lane markings) as distinct from the entities or states of affairs that they signify.¹² Indeed, 'located', as used here, applies beyond signs. As Philip Rawson (1979), whose use we have borrowed, wrote, "Graffiti on walls convey a very different meaning from similar scribbles made on a piece of paper. That graffiti exist in a certain place is part of their meaning" (p. 14). Graphic meaning is broader than that of significant signs.

However, more generally, Millikan's theory provides important general perspectives on the discussion so far. First, it features a "pushmi-pullyu" distinction between two basic sign functions, the *descriptive* and the *directive* (Millikan 1995), which makes immediately clear that our inductive cases so far have been decidedly of the latter sort. Indeed our directives have tended to the official—even the sort for official testing, as, on European protocol, they are distinguished by shape, color and marking, among: orders (prohibitive vs positive), warnings, directions, information, road works, lane markings. Also, we have focused on official public—even legally binding—signs, mainly with regard to regulated public spaces.¹³ Millikan reminds us that it is time to consider the vast, complex realm of *descriptive* spatial representations that, moreover, are 'public' only in the sense of being published—that is, made public, for public consumption.

¹² Some road and urban design seeks further integration through "signing and information when and where passengers need it; effective use of surface treatments, materials and lighting; and environmental interventions such as public art combining to create pathways, landmarks and destinations" (TfL (Transport for London). "Wayfinding" (<http://www TfL.gov.uk/microsites/interchange/82.aspx>)), even Hans Monderman's sign-free "shared space" pedestrian/traffic approach, "away from regulated, legislated traffic toward space which, by the way it's designed and configured, makes it clear what sort of behavior is anticipated" (PPS (Project for Public Spaces). (<http://www.pps.org/reference/hans-monderman/>)). This involves travelers looking at each other rather than at signs, which eye contact reintroduces our theme of reciprocal intentional awareness.

¹³ That, unlike transit maps, road signage raises philosophical problems too large to discuss here, is indicated in comments by Monderman: "All those signs are saying to cars, 'this is your space, and we have organized your behavior so that as long as you behave this way, nothing can happen to you'. That is the wrong story.... Who has the right of way? I don't care. People here have to find their own way, negotiate for themselves, use their own brains.... Essentially, what it means is a transfer of power and responsibility from the state to the individual and the community" (PPS (Project for Public Spaces). (<http://www.pps.org/reference/hans-monderman/>)).

2 Signposting

2.1 Leaving the Path

Inductively for a philosophically neglected field, we have been, like a transit diagram, mapping paths and connections that might be taken among topics. Inquiry might be rerun in different directions from ours—including backwards. We began that when, considering Millikan on the relationship of road signs to roads (inconsistent with Ittelson?), we reached her more central 'pushmi-pullyu' interchange, which ran up to all our previous cases. Next, for example, we might ask: stuck with our opening butterfly-ballot design, what might Beck have done to clarify its scan paths for users, thereby affecting world history? Could such an approach improve future ballot design? Regarding that approach, Calvert's Fig. 3a suggests an important distinction, known to commuters (subtitled "Rush Hour"?), between what urban theorists term 'connectivity and permeability'. How might permeability be incorporated in some Beck-style route diagrams? As a final example, the discussion of tracks that turn into trails, plods, paths, holloways and ridings reminds us of a common reverential experience of old ways as expressive of ancestral intentionalities, despite ancestors not having future users in mind—thereby providing an oft-noted sense of community through many generations, even if absent the intentional reciprocities stressed at the start.¹⁴

Many more connections might be explored. Most pressing, however, is the enormous terrain of public, spatially-descriptive representations. For that, no longer restricted to spaces as paths, we must venture beyond the 1D and 2D into a topic so far avoided: spatial representation in the sense of *depiction*. There is no getting around that in the digital age.

2.2 Google Earth

It is a truism that public, interactive and spatial representation have been transformed successively by digitalization, personal computers, the internet, the World Wide Web. Continuing inductively, we might do no better than to begin with the case of Google Earth. While originating in national funding (via the CIA), this geospatial system exemplifies 'public' in the widest sense (half a billion downloaders), as advertised, for anyone to "explore the world from anywhere", free, descriptively—with "a photographic realism free of the usual signs and symbols" (Brotton 2012, p. 407), thereby without even the slightly directive sense of unofficial maps. In addition, by their own choices, users can overlay graphics of various kinds, historical material, video streaming—usually in layers (via clip-mapping's textural gradients, making zooming user-friendly).

Of most interest here are this application's *interactive* features, since they exemplify a rapidly developing aspect of representation throughout information media in the digital age: a choice of forms of geospatial representation, from orthogonal satellite photographs zooming to 3D lower perspectives—these panned, tilted, rotated and including schematics, which enable even more user activity (such as a program for urban planning). Although not so interactive, newspaper and other online sites now

¹⁴ See Robert Macfarlane 2012. The title of §1.4 quotes Walt Whitman's *Leaves of Grass* phrase, cited there.

feature visuals increasingly extended from traditional still photography, drawings and graphics, to include not only moving images but linked varieties of approach to news items, including wider and narrower spaces, time and causal sequences, with digitally enhanced (usually with colors) photography, often accompanied by or overlaid with, explanatory graphics and words. In addition, elegant uses of oblique, isometric and other projections accompany the standard perspective and orthogonal forms, as drawings are inserted seamlessly into photographic movies, or vice versa. Increasingly, we see similar mixes in television news and documentaries, where graphics and numbers flow over images—even in fictions (including cinema), as entrenched ideas of medium purity are swept aside for new, more graphically based, generations. All this poses a challenge for theorists accustomed to words and mathematical symbols. Part 3 sketches an approach for meeting it.

3 E Pluribus Unum

3.1 Presuppositions

Besides the ever-increasing data storage capacity of digitalization, the factor that makes its revolutionary powers of mixture possible would be the *fungibility* or free interchangeability of information that it provides. That topic is not ours. From our user-based perspective, ours must be the complement: what, about the human mind, makes some such digitally mixed information accessible—more or less? The reply argued here will lie in the much-noted modularity of our perceptual and mental processes, but under a particular and usually overlooked application.

In posing this question it is necessary to stress “more or less”, since, from our first inductive case, we have been involved in questions of quality in information design. This is a serious, practical question—sometimes, we saw, regarding matters of life and death. Good artifact design is what works well, but much of it, including that for cognitive artifacts, falls short or fails utterly. For example, Garland (1994) provides a history of tube map revisions, most of which were failures, therefore instructive regarding the shape of human cognitive powers. Thus a 60° effort forced on Beck failed—but so did his own, radically to reduce diagonals.¹⁵ (Thus it was predictable that *Metro de Madrid*'s ‘purist’ effort to eliminate diagonals would not last.)

Appreciating the difficulties of information design disarms a quick reply to our question about user accessibility: that, as shown by normal experience with shadows, reflections, occlusions, motions, across shifting focus of foveal and nonfoveal means, environmental vision is just naturally disposed to deal with hybrids and discordant stimuli. That reply overlooks the fact that our way of coping with environmental cases is to pay no attention (there being less to seeing than meets the eye), filtering most as noise—an activity, often wearying, familiar from our previous commuting examples, providing the reason why our maps are uncluttered. By contrast, graphics are delimited

¹⁵ A misleading term steadfastly avoided throughout this study is “convention”. The tube map’s user-testing over eighty years of social change, including war conditions, over billions of travelers, representing all states of life and mind, occupations, languages, cultures and parts of the world, comprises a formidably objective experiment for invariances under multiple variations.

display artifacts explicitly designed for focused, all-over attention. There is, after all, a field called “visual information design” (Tufte 2001). But what makes effective graphic (‘visual’) information design—notably including the spatial—possible? Since such design significantly includes depiction, we may phrase the question in these terms: what makes such design, in full or partly depictive mode, possible? Evidence for an answer comes from seeing what makes effective depiction itself possible, then seeing how that suggests the broader, mixed forms of representation we have been considering. For this we need a general account of depiction.

3.2 Depiction

3.2.1 *Artifacts for Imagining*

While Google Earth, based on camera photography, makes treatment of depiction inescapable, hints of it had already appeared in our earlier cases. Thus not only geographic components such as rivers in transit diagrams, but the ones commuters apply to them, of which notable examples are the finding of figurative images there—for example, a prone ‘bottle’ (Fig. 2) that makes central London’s lines easier to pick out—also a sense of continuous flow in some diagrams, which assists following lines. Both are naturally described as *imagined* there. Road signage, too, often includes figurative shapes of things and events as parts of their designs. These work, more or less, as depictions when they engage our imagining seeing their subjects: indeed, as even the brief selection in Fig. 3 shows, their schematic shapes must be controlled so as not to engage that too much, too little, or in distracting ways. This provides a concrete, practical basis for approaching depictions in an unusual way: not in terms of pictures of things, such as photographs and paintings, but in terms of mixed or hybrid artifactual use—that is, simply as artifacts for imagining.

Imagining is an important cognitive activity, with which we spend much of our lives, waking and sleeping. It fills out normal perception and focused attention to immediate matters, while, in the natural rhythms of mental life, alternating with it. Its lack can be an advantage, but overall a practical, cognitive deficit. Next, although we can imagine on our own, being sophisticated tool-makers, it is unsurprising that we early developed technologies for extending and shaping our natural powers there, as elsewhere. Most people spend a great part of their time with these enhancers, and they represent a considerable part of modern economies. This, on the theory of Kendall Walton (1990), is the general account of visual depiction: a kind of public, cognitive artifact, whose main function is to produce and guide solo or shared activities of imagining seeing, for a variety of purposes. Of course, graphics are not the only kinds of visual depictions—since prehistory many have been three-dimensional. Also there are many artifacts for imagining that are neither visual nor particularly for visual imagining. ‘*Othello*’, as text, play or opera performance, is partly visual—or not at all, no more than is much imaginative writing, including poetry and novels, or musical song. For all such works Walton uses the term “representation” in a sense more definite than we have so far, akin to that of the ancient “*mimesis*”. How do we pick out visual depiction from this large family?

3.2.2 Interaction as Participation

For that Walton's theory requires two more steps, both of which increase user interaction. The first is to recognize that in all our imaginative projects our favored objects of imagining are ourselves. Such is clear from night and day dreaming, but it is also an important factor with public, artifact-based imagining, where our use of these things tends to be encircled by a wider imagining, which includes ourselves—that is, our physical, gestural and verbal states and actions, as well as the perceptual ones. This already begins with maps, where, unlike with verbal descriptions of locations or ways, we point to the actual marks (wearing away areas of publicly-posted ones) and call them what they represent; we trace lines on them, referring to them as paths—a very useful 'interactive' practice, which not only allows us to bring various of our capacities to cognitive tasks but to share them in public spaces. Such self-involvement, "participation", is an important dimension of user interaction not mentioned earlier. It increases beyond the gestural and verbal as the work's function becomes more depictive, then more vivid. In most of what are called 'the arts' such interaction is of course less physical, more perceptual, cognitive and emotional. However for our design topic its practice consists in mixes and modulations. Drivers' imaginations, for example, sometimes need slight stirring (Fig. 3d), but never distraction from tasks at hand, while modern technical design drawing, using the method of 'partial isolation', keeps to the diagrammatic.

3.2.3 Visual Depiction

To pick out *depictions* among these artifacts, Walton's theory suggests a further development of users' self-imagining in such make-believe activities. What makes such figurative works visually depictive, entirely or somewhat? In part it is our accessing them that way—by sight—in part their prompting and guiding both our imagining things and events and imagining seeing them (content). Yet the same holds for many very vivid linguistic representations in poetry, fiction and other writing. On this theory, what makes some works *depictive* is an efficient doubling of the self-imagining involved, which goes beyond verbal and physical self-imagining. Since we have to look at them in order to use them (access), they further prompt us to imagine of that very act of looking that it is the seeing that they have us imagine. Thereby our interaction, participation, with this kind of representation acquires an additional dimension and vivacity.¹⁶ Such self-implication in what is imagined is likely one reason why visual depiction has been barred socially, legally, ethically and religiously in many situations where detailed and visually vivid descriptions are not.

While Walton's theory applies to much of the important general subject of depictive spatial representation—notably to photographs, drawings and paintings¹⁷—our topic here is a broader one including mixed, hybrid and slighter uses: accordingly, of artifacts that may or may not be as a whole depictions, yet are, as we have seen with a variety of

¹⁶ See Walton 1990, pp. 293–296, noting that it includes additional criteria of vividness for depiction which must be excluded here, although they apply to Fig. 3.

¹⁷ It does so entirely free of mentioning truth or reality. We imagine things that are and that are not, the former pretty much as they are or not; things are as we imagined them or not, some come to be because we imagine them, etc.

examples, inflected by incitements to imagine. Such is familiar from all societies' impulses to embellish artifacts with figurative designs—for example, floral motifs—even to perceive natural forms imaginatively that way. This takes new meaning in the hybrid, mixed situations of information design. For that we need more than an account of what depiction is and why it matters: we need an account of how it works—even of how it can work. That is the challenge of the present section.

3.3 Gombrich's Way Through

3.3.1 *The Many in the One*

Fortunately, the initial part of an account has already been provided, in two ways. The first is simply stated and easily demonstrated by common knowledge; only the second requires science. Briefly, it can be shown from everyday knowledge that depiction works because it is a modular affair, made up of combinations of independent devices for rendering a variety of effects that work sufficiently strongly on people as to elicit their imagining seeing in certain ways barely or vividly. Thus the historian of image-making details what a variety of such 'toolkits' may be used, and for what variety of purposes. For spatial rendering, shaped outlines have worked since the Ice Age, as has apparent occlusion—so have foreshortening, slant-tilt shading, relative height on the image surface and so forth—if not so easily as has the evocation of faces with expressions by merely putting a few marks inside closed contours. Anyone can master combinations of a few of these, but, as in anything else, some have special knacks and interests and so become adept with complex toolkits, largely picked up from existing practice or tradition and adapted for individual use.

Important for our topic is that the modular character of depiction also allows, as we see throughout history, successful combinations of individual depictive devices with non-depictive components into effective wholes, which may be classified as wholly depictions or not. It is necessary to state these obvious facts because, despite the overwhelming abundance of this data, theoretical research on visual depiction has tended to fix on things rather than on functions, also on things by a narrow paradigm group, notably comprising paintings and photographs, which present perspective views of things combined with various other naturalistic effects.

Of the definitions that have ensued, one relaxed version from the literature may stand approximately for the rest: "Now, a *picture* is nothing but a more convenient way of arranging matter so that it projects a pattern identical to real objects" (Pinker 1997, pp. 215f). This applies to mirrors, shadows and pinholes, but not to Walt Disney's drawings, which makes it worse than saying that a hammer is nothing but a relatively 1D object with a relatively 3D object at one end, which at least holds true of most hammers.¹⁸ Thus an instance of the unsatisfactory situation noted (§2.2), as language and mathematics based thinking enters an increasingly graphic digital age. Thereby a conception of a highly varied and common artifact function, not only coeval with our modern species but even definitive of it, through its so-called 'symbolic' capacity for mental content, includes no recognition of that, and minimal attention to what it might be *for*, for users. In these terms, not only are past depictions but also familiar

¹⁸ For more careful definitions and further argument, see Maynard 2005.

contemporary ones such as cartoons, caricatures, decorative patterns on fabrics, logos, computer icons, and forms of modern art are explained in terms of ‘distortion’, ‘abstraction’, ‘selection’, ‘ineptness’, regarding the canonic.

3.3.2 Gombrich's Maker-Based Argument

Encouragingly, recent work in neuroscience begins to replace this poor science with an approach to depiction based not on visual data but on brain-function modularity (see Ramachandran 2003; Kandel 2012). It even begins to recognize that this job was already definitively accomplished over 60 years ago in famous work that had no need for neuroscience (Kandel 2012). In 1960 the social scientist E. H. Gombrich published *Art and Illusion*, based explicitly on both makers’ and users’ points of view: “we have to get down to analyzing afresh, in psychological terms, what is actually involved in the process of image making and image reading”, he stated.¹⁹ In this and subsequent writings, Gombrich was in the unique position of being able to argue from two directions—from the history of depictive practices and from the perceptual psychology of his time—regarding “the process by which the rendering of the visible world was seen to change from schematic to naturalistic styles—a process that can be observed twice in the history of art—in classical antiquity and again in the Renaissance” (Gombrich 1979, p. ix; cp. Gombrich 1963, p. 118).

Opposite the approach here, Gombrich drew much of his data from cases central to the standard view just cited: naturalistic pictures of things and events.²⁰ Already author of the most popular book ever on the history of visual images (Gombrich 1950: presently sixteen editions, thirty languages, sales over seven million), he was qualified to develop the historical part of the modularity argument. The stream of naturalism runs through multiple channels in the West, sometimes—as in Neolithic, Byzantine and Islamic, Reformation, modern art traditions—reversing course. We might say that, in effect, Gombrich demonstrated how—just as the palettes of image makers developed from the Ice Age to include more minerals (orpiment, azurite), synthetic pigments (‘Egyptian blue’, *terres vertes*), mordants (alum), vegetable dyes (madder, woad, indigo), lakes (brazilwood), animal sources (cochineal, sepia, ultramarine), glues, emulsions, oils, anilines, silver-halides, microchips and so forth—so, too, did their likewise mixed repertoires of effective rendering skills, including different aspects of naturalism—notably for particular spatial effects—for a variety of jobs, based on shifting patronage.²¹ Looking to the historically rich variety in *functions* of images rather than to holistic ‘cultural’ ideas to explain changes, Gombrich argued specific hypotheses regarding changes, notably even for the depictive rendering of views at all, and of ‘space’ itself.²²

¹⁹ Gombrich 1960: p. 25. The book was based on his 1954 Mellon lectures. Gombrich insisted that he was a historian first, of art second, and that he was a social scientist.

²⁰ Given that his topic in Gombrich 1960 was why naturalism had a history there. However, ch. X is on caricature, there are numerous examples of cartoons, and pp. 234–237, 262–65 address our topic of mixed displays that include some depiction.

²¹ Unlike performance mimesis, depiction has the advantage of material survival—thereby also allowing, by ‘ratchet-effect’ (Tomasello 1999, p. 5), rediscovery and adaptation, ‘renaissance’.

²² See Gombrich 1960, ch., IV, “Reflections on the Greek Revolution” on the invention of point-of-view depiction.

Thereby, not only the modularity but the possible coherence of selections of depictive devices has been conclusively established by a species-long 'experiment', in which many combinations of materials and techniques have proved sufficient for producing distinct kinds of complete depictive experiences, absent any sense of something missing—as we daily confirm, in our ease with a wide array of depictive styles and functions. How this is possible is easy for anyone to understand. "Doodle and watch what happens" is a method known to all, for, as Gombrich wrote,

The question is not whether nature 'really looks' like these pictorial devices but whether pictures with such features suggest a reading in terms of natural objects. ... The representation need not be like the motif. The craftsman of Jericho did not think eyes indistinguishable from cowrie shells any more than Picasso thinks baboons indistinguishable from motorcars, but in certain contexts the one can represent the other. They belong to the same class because they release a similar response (Gombrich 1960, pp. 356, 94).

In convincing depiction, we do not observe resemblances; rather we are struck by some of them, and what strikes us are actions upon the idiosyncracies of our perceptual systems of which we are largely unaware. Simple as is this insight, most of *Art and Illusion* and related papers consist in a user-based argument, addressing this next question: what is it about our perceptual processes that enables this?

3.3.3 Gombrich's User-Based Argument: "The Beholder's Share"

Any distinction between maker- and user-based considerations here must be a matter of degree, since with (non-photographic) depiction makers need to track effects as they construct their images, working at least at second-level intentionality. Besides, viewers perceive many depictions in terms of how they were produced, adding a level to the activity Gombrich termed "the beholder's share".

Gombrich's user-based argument proceeds from the parallel natures of depictive-perception and the biological perception it exploits. "*I tao pi pu tao*—idea present, brush may be spared performance" (Gombrich 1960, p. 209), and it is a commonplace that effects may be rendered by bare indications of pencil or brush. His main insight here was that environmental perception is likewise highly underdetermined, owing to radical ambiguity of signals.²³ Yet "idea present", from predisposition and context, information is conjectured automatically as a selection from presumed, limited alternatives. This is due to several features of biological perception that are transferable to depictive contexts. Perception, for Gombrich, is an activity that takes cues in terms of pre-existing hypotheses—"groping precedes grasping or seeking before seeing" (1984, p. 5)—which must be both ready and forceful, while open to revision.²⁴ Evolution has

²³ Much inspired by six years' wartime experience as BBC monitor of often faint, broken, noisy radio broadcasts: see Gombrich 1960, p. 204.

²⁴ Besides whom, for Gombrich's 1940s and 1950s work he cites Egon Brunswik and Edward Tolman, Wolfgang Köhler, D.O. Hebb and F.A. Hayek, then, increasing from the 1960s, J.J. Gibson. For extensive interaction with Gibson see Woodfield, R. ([http://gombrich.co.uk/gombrichgibson-dispute/\(2005\)](http://gombrich.co.uk/gombrichgibson-dispute/(2005))). Gombrich consistently presented Karl Popper's 'conjecture and refutation' approach as representing his own. Later Gombrich (1984) cited R. L. Gregory, Julian Hochberg, Ulrich Neisser among others.

produced both repertoires of idiosyncratic hypotheses (“to perceive is to guess at something somewhere”—Gombrich 1960, p. 259, re the Ames room, window, chair) and strong impulses to apply them, given a natural aversion to ambiguity. In today’s terms, this postulates an inbuilt ‘bottom up’ series of processes, working in modules, whose evidence he found in the cue-psychology of the time, Gestalt effects (not theory), and notably the work of Konrad Lorenz and Niko Tinbergen on what the latter termed “supernormal stimuli”. He also found evidence in the just-cited historical argument: “art offers a key to the mind as well as to the outer world”, he remarked, emphasizing the historical “open-sesame” effect of the discoveries of foreshortening, tonal modeling, highlight, physiognomy and aspects of facial expression (Gombrich 1960, p. 360).

3.4 One From Many

3.4.1 *Binding Problems*

As a historian of art Gombrich was also aware of ‘top-down’ controls—briefly, as largely based on context (expectation, which he termed “mental set”) and controlled by consistency testing, two topics that converge on ours of modular mixing.²⁵ The first, through higher-level processes affecting action and expression of the lower, is well-accepted (for example, by Frith 2012, p. 12), while the second completes the feedback loop in a particular way. Our topic however is broader, as it concerns not only depiction but also mixed modes of nondepictive spatial representation that might contain it, even as a minor feature—for our question was, what, generally, holds them together as successful information designs? Here Gombrich’s and our situations fit a familiar methodological pattern for modular approaches. For a famous example, had Golgi’s holistic thesis of the entire nervous system as the basic unit, rather than Ramón y Cajal’s neuron, been correct, we could never have understood the system—also, we would never have evolved in the first place.

Yet, in general, explaining binding of modules is a challenge. For example, modern neuron theory faces the difficult task of explaining how very complex systems of neurons—indeed, hierarchies of them—can do their work, and evolve. Similar to neuron-based science, Gombrich the social scientist, rejecting the neoHegelian ‘spirit of the age’ or ‘people’ holisms of his background (Gombrich 1960, pp. 19–21²⁶) in favor of an empirical approach to historical developments in images, faced the reverse problem, of showing how, since styles are undeniable, such complex wholes can be understood in terms of parts, without—as is now common—a reductivist neglect of the wholes’ undeniable emergent properties.²⁷ Yet while Gombrich’s second, biological, argument

²⁵ While Eric Kandel 2013 (p. 202) interprets Gombrich here in strict ‘bottom up/top down’ terms, with a Gestalt theory account of the former, this is misleading in several ways. Although not using these current terms, Gombrich was consistently skeptical about the dichotomy, and, while he did use Gestalt effects in that regard, was repeatedly critical of Gestalt theory (see Gombrich 1960, pp. 264f; Gombrich 1984, p.4).

²⁶ Also Gombrich 1963, 88–91, 114; 1984, p. 215; Gombrich 1969 *passim*.

²⁷ “Reductivist”, so as to make a vital distinction from Kandel’s “reductionist” (thus modular) method, q.v. Kandel 2006, pp. xiii, 9, 201, 203f (“radical”), 245, 313, 372, 424—which, in my opinion, is lost by Kandel 2012, p. 508, marring his entire enterprise there. Ramachandran (2003) reductivist ‘neuroaesthetics’ ignores the distinction.

has been confirmed by the following decades' emergence of the disciplines of artificial intelligence, cognitive psychology and neuroscience—each of which has made increasingly clear how visual experiences are constructions from relatively distinct submodalities²⁸—he seems to have been less aware that, for individual works, what are now termed “binding problems” appear, notably in the hybrid modes we are considering, where design challenges the “consistency tests” of normal vision on which his theory relies.

3.4.2 Works as Worked: Binding by Purposes

Looking back to Gombrich's first, historical, argument, regarding our topic of depictive forms of spatial representation, technical advances in binding distinct cues mark styles, indeed eras, of image-making. While oblique parallel forms, for example, have long histories in various cultures, the most discussed by modern theorists is linear perspective. While amateurs typically take that holistically (a central part of the canonical view), history shows what image makers understand: that, in accord with our modular findings, it is actually a concomitance of devices that transfer independent cues from environmental spatial perception—including occlusion, foreshortening, height in visual field, relative size, relative density—any of which may be present or not in a unified visual situation, environmental or represented—in the latter partly because each factor or combination has costs as well as benefits for a given task.²⁹ Cartoons, for example, which emphasize 'what' more than 'where', are among the long history of drawings that favor the orthogonal and oblique—often mixed with some perspective effects—as does even much product advertising photography. While such are among the compositional challenges of designers, our theoretical problem is simpler. Fortunately, it is also far simpler than the corresponding problems for theorists of perception, memory, mental development (Frith 2012), even consciousness. This is because our data are without exception restricted to display *artifacts*, for which users have the great advantage of assuming purposes and standard uses, the resources of §1.2.

Treating something as an artifact, we have seen, means taking it as possessing intentional affordances—that is, characteristics for use, for shared purposes, goals. Depending on the kind of artifact is our attention to such properties and purposes. This firmly guides our perception of it, in ways more or less definite and correct (it being possible to take the wrong end of a stick). It follows that our experiences of the entire class of graphic cognitive artifacts that we have been considering are strongly shaped by our understanding of them as display artifacts. Accordingly, unlike nature, we look at them and their features in terms of purposes, final causes—notably, for intentional affordances for perception and related kinds of cognition. Artifactuality thus provides a powerful, constant binding principle for all the modular mixtures that we

²⁸ Gombrich's emphasis on the “Beholder's Share” in connection with the radical ambiguity of vision is a main theme of Kandel's exposition of his views in Kandel 2012, pp. 205–213. For his engaging review of the early modular research (notably by Vernon Mountcastle and Stephen Kuffler, then David Hubel and Torsten Wiesel), see Kandel 2007, pp. 296–305.

²⁹ See Cutting 2003, p. 237n6, a paper which includes a relevant study of how unified depictive space can be built up from a series of modular depth devices in Ice Age work. For a brief account of various common projection systems through the history of image making, see Dubery and Willats 1972.

have seen to be characteristic of spatial and other kinds representations, which digitalization is sure to increase in future.

Where *depictive* representation is involved, we can be even more specific regarding purposes. The account of depiction outlined in §3.2 tells us that while the purposes may be multiple, among them is prompting and prescribing a particular kind of activity, which joins our actual perception of the work with our imagined perception of its subject-matter: that is what its relevant features are *for*. Thereby, besides whatever binding actions depiction borrows from environmental perception, it always embeds these in the background action of display-artifact perception, which is interrogative in a different way, its ‘why’ questions being in terms of purposes. For example, the question why one shape in a picture occludes another or is lower in the visual field may have natural answers, but those will always be within the context of non-natural ones, in terms of what such features are *doing* there. Likewise the question why, in a drawing, lines defining the edge of a road converge is not fully answerable in terms of optics, as it needs to be added that this is so, at least partly, to prompt imagining seeing the road run back in space. Such is not true of a natural scene. By contrast, the question why, in an isometric drawing, lines defining the edges of a building do not converge may be answerable in terms of wishing to preserve true proportions, though not true angles. Unlike environmental perception, “What’s that for (or: ‘doing there’)?”, applies to every relevant feature of every depiction. This makes for a great difference from environmental perceiving.³⁰

3.4.3 *Facture*

Similar considerations apply to our wider issue of incorporating depictive effects in spatial displays that include non-depictive graphics. As it would be a large project to investigate other binding principles there, let us close by returning to §1.2’s theme of intentionality levels, where it was suggested that understanding public spatial representations entails taking them to be artifacts, which involves both vertical and horizontal intentional assumptions, linking us to makers and other users. We next saw that understanding some of these as *depictions* entails two additional kinds of interaction, through participation. Even beyond depiction, how much we experience a given work in terms of its makers, besides simply taking it as having been made and displayed for purposes, greatly varies. For example, it has a distinctive meaning when a sign is for official purposes. For a broad range of cases, including depictions, a new dimension of meaning opens when *facture*—the worked materials of the display or its process of production, as perceivable in it—is relevant, as we saw with the natural signs of §2.1.

Facture significance might be viewed as the maker complement to the user situation with depiction. Just as with the latter the necessary act of accessing the sign is taken into the objects of imagining, to increase participation, with

³⁰ Three observations:

- 1) For some qualifications regarding photo-depictions see Maynard 2012.
- 2) This argument can be made without the earlier reference to levels of intentionality, so long as artifacts are understood in terms of final causes, purposes.
- 3) The argument has significant consequences for most philosophical and psychological literature on depiction, which, shockingly, overlooks the elementary fact that when we look at pictures we notice that they are artifacts. Accordingly, the field abounds with pseudo-problems.

the former evidence of the necessary acts of production of it may become part of its content. Maker and user then meet partway. More generally, since we are strongly disposed to understand things in terms of their process histories—especially where these are intentional—it is not surprising that facture can be a significant resource with public signs of various kinds. Waymarkings (§1.4.2) provide one example, when their distinguishability from natural or accidental signs is assisted by making evident how they were purposely embedded in context. The relevance of facture varies greatly across the breadth of signs, representations, depictions; accordingly, emphasis on makers' intentionality varies. But at this point we stop, since, with varying motives, these notes on public spatial representation have had no dependence on the following ideas: reference, convention, iconic, reality (real world), truth, aesthetic—artist.

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