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Chapter 2

Educational mechanisms of dioramas

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The diorama remains one of the most popular exhibit types in museums, and it has proven its educational potential time and time again. In spite of this, the specific mechanisms behind that educational potential remain unclear. In other words, museum practitioners and museum researchers know that dioramas work, we just don't know how they work. In the following, we use visual perception theory as well as cognitive linguistics to explain the perceptual and meaning-making mechanisms that give dioramas their unique potential. Specifically, we construct a framework to understand how museum visitors can 'translate' the visual scene from what is essentially a collection of specimens in a box into a meaningful experience.

Meeting the objects

Designers and curators tend to take their own perspective on the museum experience and conceptualize museum visits as communication: an indirect communication of design intentions to visitors mediated by exhibits, labels, explanatory signs, and narratives. From the perspective of the museum visitor, however, the basic level experience can best be described as a meeting with artefacts or natural objects on display. Museum artefacts and objects may involve interaction and dialogue, but usually they are not directly communicative unless they take the form of guided tours, multimedia installations or live animals. Rather than a form of communication we will frame the basic level experience of museum visitors as a form of inquiry.

Meeting artefacts and object in the museum context is bound to raise implicit questions of identification corresponding to explicit questions such as "what is this?" The interest and motivation of museum visitors will also orient their attention, but embodied perception and basic level categories are generally at the core of human experience (Evans & Green 2006). At a basic level of observation visitors may have enough prior knowledge about an exhibition and its subject matter to identify objects immediately. The inquiry aspect of a museum visit will arise when visitors are confronted with exhibited objects they cannot immediately identify or situations they do not understand. This can set in motion a sequence of actions such as looking for information on labels or explanatory signs next to a diorama. Our focus here is however on the experience of and learning from dioramas in natural history museums (although we note that dioramas also occur in anthropological and technical museums, and that similar educational

mechanisms may be at play in these settings). As a naturalistic or pseudo-naturalistic display of objects (e.g. humans, animals, plants, machines) in their natural or cultural environment, dioramas and their interpretation can appear straightforward, but complexity hides behind the naturalistic surface.

Figure 2.1. Oryx gazelle diorama from the American Museums of Natural History. Image courtesy of Creative Commons, https://www.flickr.com/photos/mukluk/440494699

Consider the African Oryx gazelle (Gemsbok in Afrikaans) diorama in Figure 2.1 from the American Museum of Natural History in New York. Visitors might find this static display of gazelles rather uneventful. We immediately recognize five similar gazelles assembled on an African savannah, and we will probably focus at first on their impressive horns. If we dwell in front of the diorama, we might, however, be more intrigued or even disturbed by the scene. The gazelles are not just on display as in a static image: we discover that they are actually looking back at us! We know that we are just looking at artefacts, but for a moment we are propelled into the scene on the savannah, as if we were really there as participants in an interspecies meeting. We have created an *imagined event* from the static display of artefacts, but how is this possible? Before discussing this we will introduce some concepts from perceptual psychology and cognitive linguistics in order to analyse how we recognize and interpret visual scenes.

The Gestalt laws of perception

Even though the concept of Gestalt is commonly used to describe perceptual patterns, the origin and nature of the Gestalt laws are not generally appreciated. Gestalt psychology gradually developed as a reaction to the focus of early experimental psychology on elementary sensations in the beginning of the 20th century. Perceptual psychology had been pioneered by physicists, among others Herman von Helmholtz

(1821–1894) and Gustav Theodor Fechner (1801–1887), but in the specific form of a *psychophysics* of sensations. Inspired by phenomenology, Carl Stumpf (1848–1936) founded an institute for experimental psychology in Berlin around 1900, and the movement known as Gestalt psychology was formed by his students Max Wertheimer (1880–1943), Kurt Koffka (1886–1941), Wolfgang Köhler (1887–1967) and Kurt Lewin (1890–1947). In reaction to the elementary sensations studied by classical experimental psychology the Gestalt psychologists claimed that the perceptual experience of humans and others animals was given in the form of structured wholes, and that these 'Gestalten' had their own inner laws of organization and dynamics (Ash 1998, 220). The first Gestalt laws were formulated by Max Wertheimer in the early 1920s, and included the basic principles of *proximity, similarity, closure* and *good continuation*, and Köhler made German Gestalt theory known internationally through its opposition to introspection as well as to behaviourism (Köhler 1947).

The basic Gestalt principles are still valid today, and widely utilised in information visualization and interface design (Palmer 1992; Ware 2000). According to the *proximity* principle we will experience objects that are spatially close as meaningfully grouped together, and according to the *similarity* principle we will experience objects that are visually similar in shape, size or colour as meaningfully grouped together. *Closure* and *good continuation* are related phenomena where we tend to supplement perceived curves and shapes in order to identify them as simple geometric figures. We will for instance recognize a broken ring as a circle and a broken line as a line, and we will similarly tend to look for simple geometric shapes in the contours of objects, even if we have to supplement with our own imaginary contours. These principles of closure and continuation are important for naturalistic perception. Notice how we will naturally perceive the partially occluded gazelle in the background of the diorama (Figure 2.1) as a whole gazelle, and not as a gazelle head severed from the rear part of the animal! Furthermore we clearly recognize the gazelles as a group closely related by spatial proximity, and – as stressed by the Gestalt psychologists – we experience all these phenomena as *given* in perception and not as assembled or constructed from elementary sensations.

This leads us to another aspect of the perceived scene, namely its organization into foregrounded *figures* and the *background* of the visual scene. Ambiguities of the figure-ground organization were discovered by the Danish psychologist Edgar Rubin (1886–1951) and further discussed by Köhler, but the fundamental figure-ground phenomena is the separation itself, i.e. the foregrounding of figures in perception. In order to work out how the Gestalt principles of perception work as part of a more comprehensive interpretation of visual scenes, we have to consider how they interact with embodied cognition and language. This is explicitly addressed in cognitive linguistics where the grammatical structures of natural languages can be seen to add more structure to the organizing principles of perception (Evans & Green 2006).

Schematic meaning in grammar and cognition

One of the fundamental assumptions in cognitive linguistics is the idea that grammar is not a formal syntactic system but carries meaning beyond the individual words in phrases. This is stressed in different traditions of cognitive linguistics such as cognitive semantics (Talmy 2000) and cognitive grammar (Langacker 2013). The grammatical meaning in conveyed by word classes (nouns, verbs, prepositions, adjectives etc.) and by grammatical forms such as metaphorical constructions and other types of schematic and idiomatic expressions. Nouns represent objects, verbs events, prepositions relations, and adjectives properties, and as such they carry schematic meanings beyond the individual words.

Another fundamental assumption in cognitive linguistics is the idea that spatial representation and spatial reasoning plays an important role in binding together language, cognition, and action by sharing schematic meaning. An example is the figure-ground effect in perception that is elaborated in natural language by linguistic operations that will correspondingly *profile* objects and events in the foreground of a described scene and push other aspects of a situation in the background. Another example is that we will always construe a described situation from a particular *perspective*, just as we will always experience a scene perceptually from a particular physical perspective.

It is because perception and language share schematic meanings that it is possible to 'translate' between them. Otherwise it would be a mystery how the visual structure of a situation could somehow be related to structures in a language. We do, however, find it quite easy to describe the scene of a situation we are experiencing or conversely, to visualize in our imagination the scene of a situation being described to us.

Consider the tiger diorama in Figure 2.2 from the Natural History Museum in Helsinki. Visitors can move past the diorama and change their physical perspective from e.g. behind the tiger to a perspective in front of the deer being attacked. This will correspond to a change in relevant descriptions from the perspective of the tiger as grammatical subject (e.g. "The tiger attacks the dear") to a passive construction where the deer is the grammatical subject (e.g. "The deer is attacked by the tiger"). The most striking feature of the diorama is clearly that the static scene is experienced as a dramatic *event*. The Gestalt psychologist was in fact preoccupied by the dynamic nature of apparently static visual scenes as well as the *apparent motion* constructed as a Gestalt from a sequence of static images (Ash 1998). The tiger diorama seems to take us a step further though: even though we only see a single 'frozen' image of the apparent movement, we are compelled to *imagine the whole event* of the tiger's leaping jump and the attempted escape of the deer. We do not need a series of 'snapshot' scenes in order to complete the movement (cf. the Gestalt effect of good continuation). We can actually 'see' the movement event in the static scene.

Figure 2.2. Tiger diorama at the Natural History Museum in Helsinki, Finland. Image courtesy of Creative Commons CC0 1.0 Universal Public Domain Dedication.

On the level of language this event can be elaborated in different ways according to the *perspective* we take in construing the situation, i.e. with the tiger or the deer as grammatical subjects and actors in the imagined event ("The tiger attacks the deer", "The deer is attacked by the tiger"). We can however also *profile* the situation in different ways when describing it, corresponding to the attention we can pay to different aspects of the situation. We can for instance say that "the dear is fleeing" profiling only the deer, or "the tiger is jumping" profiling only the tiger. We can even profile the background and imagine a past event ("It has been snowing"). This distribution of attention is another fundamental aspect of how meaning is constructed in language and perception (Talmy 2000).

The different possibilities of meaning construction that arise from Gestalt perception of visual scenes and their basic schematization, as well as the different choices of perspective and profiling, will simultaneously provide possibilities for dialogue and learning. The imagined event of the tiger diorama can trigger many questions concerning aspects of the situation: How can the tiger manage to jump that high? Will the deer have any chance of escaping? Many types of inquiry about the scene can depart from the diorama: about the event itself, about the species involved, about the landscape and its location, and even about more conceptual and theoretical issues derived from the scene such as predator-prey relations, the habitats of tigers, and their status as an endangered species.

Levels of meaning

The construction of meaning made possible by the diorama is however not limited to the *lexical level* of object recognition and the *phrastic level* of scenic descriptions that we have discussed so far. Families and groups of children observing the tiger diorama will most likely engage in storytelling and dialogue. This is meaning construction at a *narrative level* of meaning (cf. Achiam et al., 2014). In this way the apparent motion of the scene will not only be the basis of an imagined event, but also the point of departure for a narration of its probable past and its possible future as well as the imagined intentions of the involved figures.

The kind of involvement we experience with the scenes and imagined events of dioramas bears witness to our power of imagination and the organizing power of language and perception. Meaning construction can be understood as proceeding on a number of levels from the perceived objects and their basic description (lexical level), to the construal of situations and events (phrastic level), and to their elaboration into stories about the past and the future as well as the intentions of displayed actors. On an even higher level of construction we have to acknowledge that the diorama as a whole, as well as the actors within it, might take on a communicative role. The diorama can have a rhetorical or "ideological" function by addressing the visitor as a spectator and as a witness to a particular scene. Looking at the scene of the tiger diorama we are in sense caught as passive bystanders to the (imagined) dramatic event, and the diorama is thereby addressing us and imposing additional meaning associated with survival or ideological conceptions (e.g. "nature is cruel"). This we will call the *discursive* level of meaning. In semiotics this form of implicit communication that addresses us as participants is often called enunciation.

The discursive level is also operative in the Oryx gazelle diorama of Figure 2.1, and this is what can appear as disturbing. In the moment when we realize that the group of gazelles are looking back at us, we are (so to speak) addressed by them and their gaze. This is a moment of suspension of disbelief, where we meet the other species (in our imagination). Here, the diorama is a powerful mechanism for *including the visitor in the scene*, and thus much more than a mere image or a collection of artefacts.

Learning from dioramas

The learning potential of the diorama arises from the imaginative richness of the content it creates by placing artefacts and natural objects within a naturalistic scene (or relevant cultural context in the case of technical museums). There are, however, also several problems of learning associated with the diorama. One potential problem is the very naturalistic articulation of the diorama that creates an *apparent realism* that could entail false inferences. One typical example from museums of natural history is the educational attempt to present many species that live together in a particular habitat. In

order to present several species within the frame of the diorama they are often clustered very closely in the scene, and sometimes a (false) reason for this is introduced in the scene itself, for example by distributing the animals around a water hole. In reality different species would disperse over a larger area. An example is seen in the African Plains diorama from the American Museum of Natural history (Figure 2.3).

Figure 2.3. Close clustering of species in the *Plains diorama* of the American Museum of Natural History. Image courtesy of Creative Commons: https://commons.wikimedia.org/wiki/File:Plains_Diorama.JPG

Some dioramas do however break off from this apparent realism by being visually more schematic. An example is the Bird cliff diorama displaying typical birds of the Faroe Islands from the Museum of Natural History in Copenhagen (Figure 2.4). This diorama has a black and white image of the tall cliffs characteristic of the Faroe Islands in the background, but the exhibited birds in the foreground are placed on highly schematic (and purple!) platforms as a kind of visual metaphor for cliffs. Significantly, these metaphorical cliffs do not look like the image of cliffs in the background.

The absence of apparent realism in the *Bird cliff* diorama is also conveyed by the location of text within the diorama labelling and describing the different species. This disruption of apparent realism could be helpful in avoiding the potential mistakes in reasoning about the living space of different species within a habitat, but on the other hand the fascination of the naturalistic diorama is lost in this schematic display.

Figure 2.4. Highly schematic *Bird cliff* diorama from the Museum of Natural History, Copenhagen. Image courtesy of Michael May.

The learning potential of dioramas should also be understood in the larger context of the explanatory signs outside the frame of the diorama, the possible interactive mechanisms supported (like user-controlled selective spotlights), the potential of supplementary multimedia like explanatory speech, smartphone apps, ambient sound or additional video next to the diorama. Furthermore, the meaning construction of visitors will often take place within dialogues with others (families, school classes) rather than privately (in thought), and accordingly the meaning construction and inquiry will be externalised and embedded in dialogues as fragments of speech (cf. the analysis examples in Achiam et al. 2014).

Conclusion

Naturalistic habitat dioramas have been described as "windows on nature" (Quinn, cit. Kamcke & Hutterer 2015). These types of naturalistic dioramas displaying animal and plant specimens in their natural habitat were developed in association with a gradual epistemological change in the natural sciences towards an awareness of systems and systemic relations in nature, and habitat dioramas were intended to convey an appreciation of the relationships between the flora and fauna of an environment (Rader & Cain 2014; Marandino et al. 2015). It is striking that this gradual shift in the public communication of natural history in the museum context towards scientific naturalism and an awareness of ecological systems occurred in parallel with the rise of Gestalt psychology and the critique of classical experimental psychology and its focus on psychophysics of sensations and isolated stimulus-response mechanisms.

Habitat dioramas are accordingly much more than windows on nature in the basic sense of aesthetic and naturalistic displays. They provoke inquiry and reflection through the meaning construction they support. The traditional perspective on dioramas as communicating 'messages' is, however, too simplistic, as we have indicated here. It can be argued, for example, that the habitat diorama often conveys an indirect message corresponding to the intention to increase awareness about nature conservation (Kamcke & Hutterer 2015), but the reference to indirect or unspoken communication does not explain the educational mechanism of the diorama, i.e. how this interpretation of the diorama can actually take place. Our proposal has been that we can understand the educational mechanism of the diorama by referring to the principles of visual object and scene recognition as originally described by the Gestalts psychologists, and furthermore by embedding this understanding in a more comprehensive conceptualization of meaning construction as developed within cognitive linguistics (Evans & Green 2006) – specifically in cognitive semantics (Talmy 2000) and cognitive grammar (Langacker 2013).

Meaning construction from observing dioramas will take place on several levels of meaning starting with the perceptual object and scene recognition and the corresponding lexical identification of objects. Museum visitors will then be able to conceptualize the scene of a diorama on a phrastic level corresponding to simple statements in natural language about the scene in accordance with their prior knowledge about the exhibited objects. This sentence-like meaning can take the form of inner thoughts or fragments of speech as part of a dialogue between visitors sharing an experience. A further level of meaning is the narrative level, where stories are constructed from the scene of the diorama. These stories are sometimes supported by added external sources such as video and explanatory diagrams, but stories can be invented by visitors even without such external support (Achiam et al. 2014). Finally a discursive level of enunciation is required to understand how the diorama can actually address us without any direct speech, and this is where the rhetorical and ideological messages of the habitat diorama should be positioned. A detailed understanding of these levels of meaning and how they are connected would of course require a more comprehensive analysis than we have attempted here.

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