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Michael A R Biggs

Knowledge and Advancement through Models

Abstract

Physical models are not only used to represent the appearance of designed objects but also to represent ideas. However, if physical models are used to represent ideas, what must they have in common with their objects in order to function? It is suggested that an ability to name the characteristics which link the object and model is unnecessary. Gombrich's criticism of the "innocent eye" is accepted. However, Goodman's extreme Conventionalism is rejected on the basis of its inability to account for the first use by the creator or viewer. Positive suggestions for the role of models in the advancement of knowledge in Art & Design are found in Hertz's and Boltzmann's Formalist theory. This is developed to emphasise the social practice of the use of models, in preference to the traditional Illusionistic or Conventional analysis of their relationship to the objects they represent.

Knowledge and Advancement through Models

When we use physical models we do so to gain information about the object or idea that the model represents. To this extent the physical properties of the model are secondary to their referents or meanings. Using a model enables an overview to be gained of a subject. There are cases where the relationship between the model and what it represents is simple: for example the visual resemblance which subsists between a client's visual of a product and the manufactured product. However, physical models are also used to represent structures and ideas where their principal function is not visual resemblance but some other form of correspondence, such as structural similarity. Such models make clear certain relationships which are obscured in the corresponding objects. This paper discusses those properties which such models must possess in order that they function as reliable, and not arbitrary representations. In particular, the use of models in research requires that models offer a clarity and perspicuity that validates their use.

Models do possess physical properties. The physicality of models is of concern to the practitioner but I assert that these properties are not the prime concern. Although there are considerations of materials technology in, for example, product design; this is the physics of the object. Practitioners cannot be ignorant of the knowledge they require to make models, but it is a means to an end. These physical means provide the vehicle for the representational content of the model and it is this which is the main function. The designer establishes his or her reputation through the content of the work, the imagery, rhetoric, etc. of the model, and these collectively communicate to the user.

If we accept that the main knowledge-content of a model is its meaning rather than its properties as a physical object this will guide us towards a specific set of data which must be captured in research, and

must be sought out in any proposed research methodology. The keyword here is "representation". The use of physical models represents something outside itself. It makes references to, and the user makes connections with, knowledge and imagery which is stimulated by the model. However, the physical properties that the model possesses of-itself are subordinated to this role.

I suggest that such a model provides us with a new perspective on data we already possess. This places the kinaesthetic properties of the model-as-object in their appropriate secondary place. It emphasises the communicative aspect of the model as a prompt to the reassessment of received [kinaesthetic] data whilst recognising that the new model is itself an object in the world and itself providing data. But how is this perspectival reorientation achieved?

An important aspect is that the model resembles other existing models and objects. Here I mean simply that we recognise the model as another product, organisational structure, etc. However, the product designer has ensured that it is not identical with existing products, etc. The model therefore modifies the family of objects we group together as occurrences of this type. So the new model modifies those collective qualities attached to the nature of the object. It is a direct application of Wittgenstein's "family resemblance" approach (cf. Wittgenstein 1953 sections 65-67) where it is unnecessary to be able to list the qualities an object must possess to belong to a particular class. For example, what are the defining characteristics of a toothbrush? We use words and classifications in a much looser way in practice. There may be no single defining characteristic which makes an object a member of a class. This is a familiar approach for the creative practitioner. Indeed change in the field of Design frequently requires radical change of the overall concept.

Making a comparison with the physical sciences, it implies that the model does not act merely as a catalyst. It does not prompt us to take this new perspective but forms one active ingredient in the collection of images from which we form our perspective. This too is compatible with "family resemblance". So the method of the use of physical models is to alter reality at the same time as assessing it. This in turn implies that there are no objectively preferable perspectives as they are created by the objects and models themselves rather than being imposed on whatever objects happen to be under review. "Research" will consist at best of the creation of a coherence theory, in which we resolve relationships within our perspective, rather than a correspondence theory in which we validate our method by enquiring into the correspondence between it and reality.

Goodman asserts that the representational qualities of an object function entirely conventionally. That is, that there is no primary role for visual similarity in the relationship between a model and what it represents. This is an extreme view. Its main difficulty lies in accounting for a representation's first use by either the creator or the user. A convention has to be established as a regular practice amongst a group of people, for example the convention in perspective that diminution in size indicates receding depth. This example is contrary to the convention of size in Byzantine painting in which it indicates relative importance and not spatial position. These conventions have to be learned. It is particularly apparent in the Byzantine case as this is not a convention to which we are accustomed in everyday life. It is more difficult to disassociate the conventionality of perspective size changes as they seem natural to us.

The difficulty of first-use is that no habituation or custom has been established. The creator may assert a particular practice when establishing the representational relationship, but it remains to be transmitted to the user as a strategy for decoding. It also remains to be established whether the creator has followed the stated practice in his or her first use too. Regarding the former, we are now familiar with the concept that a representation, such as a projection drawing, does not carry with it both the image which is a representation of something else, and the means for its decoding. The information for decoding is learned elsewhere. That information is not presented to us in the form of a projection drawing (cf. Wittgenstein 1961 sections 2.12-2.18). Thus the first-use of a projection drawing requires

prior familiarity with a set of information or instructions (which is not itself in the form of a projection drawing) and has been prepared to act as decoding information. In the case of the latter; the establishment of the truth that the creator has used his or her own rules, we also have a point related to the lack of a publicly accepted convention or practice. Arguments for this difficulty are more obtuse and I recommend the reader to Wittgenstein's so-called "private language argument" (Wittgenstein 1953 sections 243-314). These arguments centre around the fact that the creator has nothing against which to compare his or her practice in order to assert that it has been consistent, that is, in line with the convention it is desired to establish. Recourse to memory of the rules by which the practice is governed is neither necessary nor sufficient.

The first-use argument seems to require the kind of "innocent eye" that Gombrich rejects if any natural association between the model and what or how it represents is to be maintained. Of course, the Conventionalist may not demand such a connection but then answers must be found for the first-use objections. The innocent eye is also suggested by some of the apparently natural properties of, for example, geometrical perspective. It is tempting to find a correspondence between the persuasive imagery of perspective and our ability to define rules for its construction, and the "natural" projection of an image onto a plane through a lens, i.e. photography. Whether the projection is natural, that is innocent, or whether the geometrical arrangement of the plane and lens somehow artificially imitates the construction of perspective I shall leave to the reader to decide.

In summary, although a physical model functions as a representation of something outside itself the relationship it has with what it represents is not fully accounted for by reference to a series of conventional systems. There are therefore limits to the range of possible reference, especially when considered at the moment of first-use. There are also limits to the interpretation of existing relationships because even the creator cannot provide a reliable basis for the association. In terms of research this means that the development of a particular form cannot be undertaken within an entirely arbitrary set of relationships, and is also strengthened when established use provides limits to the validity of particular interpretations.

What do the foregoing observations amount to with regard to the nature of knowledge which is available in the use of physical models, or as the outcome of research in the subject? The key factor is that using physical models contributes to the data we are assessing. They do not simply add information which is missing and complete a view on a particular subject. They add to and modify the perspective we have based on the set of available objects, including models of those objects.

The requirement would seem to be that we must have confidence in the representational relationship whereby an model may be said to be good, or adequate representation of its subject despite its differences. The more transparent this relationship is, which is to say, the less the relationship interferes with the transmission of the essential characteristics of the object via the representation, the easier it will be for us to gain knowledge of the object represented. However, it may be assumed that a representation is only made because the original object presents some difficulties of comprehension or analysis. For example, a map is made of a piece of terrain so that an understanding of certain features may be gained which would be difficult from an inspection of the terrain itself. The transparency is inextricably bound to the user's requirements since the geological map and the road map each clearly (transparently) communicate information about the terrain itself, but are not interchangeable for the users.

Hertz and Boltzmann have presented this as a Formalist theory of models. They dispensed with any need for there to be a visual correspondence between the model and what it represented. That is, the model needed to behave in the way that the object represented did, and the model needed to be useful, but whether the model was like the object represented in any other ways was irrelevant. We are familiar with these very abstract forms of representation from mathematical models of weather

systems, etc. They have very few physical similarities in common, but the inter-relationships which subsist within the model are comparable to those in the objects which they represent.

In such cases the dissimilarity of the representation is liberating because it allows us to exploit the particular characteristics, the representational characteristics, of the model. Dissimilarity is also a necessary and sufficient condition of representation itself (Aristotle 1410B12). We would not regard the weather system as a model of itself, not because it does not have the capacity to demonstrate its own characteristics, but because we want greater perspicuity; to discover information which we cannot discover from an examination of the object itself.

The theories of Hertz and Boltzmann do not require that the semantic relationship between the model and what it represents is missing. Indeed the early Wittgenstein, writing around the same time, would argue that it is only by a necessary similarity of form that the model is able to be a model or picture of what it represents. So we may have confidence that our resultant practice is grounded in some relationship. However, we cannot use this widespread practice as a basis for conclusions about the world beyond our models. This sounds limiting, or at least weakening.

However, its strength lies in the syntactic relationships: the relationships between its parts. New physical models demonstrate these relationships. They modify our perspective on a group of objects, partly by representing them and then by contributing to the group themselves. The most that can be ascertained is that the relationships between the model and the object it represents are coherent. Then the set of available data is modified by us possessing objects plus models. Subsequent models will thus need to be different if they are to comment on this new data set. The result is a dynamic set of references which is maintained and analysed not in the world of objects but in the world of practice. How models are used as perspicuous representations and how that modifies our view of the objects they represent becomes the overall subject of research. Progress in such a system is made by the analysis of practice; of what we do with these models, and not by the analysis of how the models represent something else either by convention or by resemblance.

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Dr Michael A R Biggs
University of Hertfordshire
Manor Road, Hatfield
Herts. AL10 9TL