

## Solid Knowledge: Notes on the Nature of Knowledge Embedded in Designed Artefacts

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**The great icons of industrial and architectural design are cornerstones of our material culture. They are referred to again and again in education, research, and cultural debate, and as such they have become nodal points of human discourse. The knowledge embedded in such artefacts has often been referred to as “silent knowledge”. Drawing on the one hand on an analysis of the elements of the design process and, on the other, on a simple model for knowledge construction as such, taken from the world of scientific research, this article discusses the nature of such silent knowledge. It is argued that the structure of any new knowledge contribution is the same regardless of field, be it art, philosophy, or science, whereas the phenomena involved are different.**

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### INTRODUCTION

The great icons of industrial and architectural design, such as the Bertoa Diamond Chair (Bertoia, 1952), the Sydney Opera House (Utzon, 1957) or the Philippe Starck citrus-squeezer known as “Juicy Salif” (Starck, 1990), are cornerstones of our material culture. They are referred to again and again in education, research, and cultural debate, and as such they have become nodal points of human discourse. What is it that distinguishes these artefacts from the general stream of products and environments? What is the nature of their force and influence? And, although being very different in nature and approach, what is it that they share? An answer to these questions could eventually outline the nature of the knowledge - often referred to as “silent knowledge” - that is embedded in such material artefacts, and could eventually form the basis for discussing the relation between scientific and artistic approaches to design research.

### ON THE CONSTRUCTION OF EXPLICIT KNOWLEDGE

The artistic, creative, and individual minds that created the above-mentioned artefacts, as well as the rest of the class of “high design” objects that they are part of, base their praxis on experience; experience in perception, function, technology, and many other issues involved in the construction of artefacts. Such experience is what, at a basic level, is passed on in schools of art, design, and architecture around the world, yet such experience is not knowledge. Individual experience or even collective experience that is passed on by word of mouth is not knowledge, but culture. To discuss how cultural contributions in the form of designed artefacts relate to contributions to human knowledge, let us look at the nature of knowledge construction; specifically, the criteria for evaluating knowledge created in scientific research. With its peers and disputes, the scientific system is mankind’s institution for knowledge. In the small-scale reflection at hand, we do not need to bring out the full register of epistemological reflections. We will make do with a simple, straightforward scheme that can take us the first part of the way.

The Norwegian professor Ole Petter Ottersen, Centre for Molecular Biology and Neuroscience, Department of Anatomy, University of Oslo, has published on the internet a pdf document that identifies the criteria which define the quality of research. Ottersen is a distinguished scientist in the field of natural science, a field usually considered rather alien to design. As we shall see, the structure and basic criteria that work for knowledge constructed in natural science nevertheless parallels criteria for innovative design.

Ottersen introduces three pillars of quality in research: *originality*, *relevance*, and *solidity* (Ottersen, undated). This is probably not the last there is to be said on quality in research, but it is hardly controversial: Most would probably agree



Figure 1. Juicy Salif, 1990. Image by Alessi s.p.a., published with permission.

that these factors constitute acceptable guidelines for qualitative contributions to the field of research and thereby to the field of knowledge. Let us therefore examine these three in more detail, and discuss their relations to design.

On the first pillar, *originality*, Ottersen points out that the qualified contribution to the body of research (and thereby to human knowledge as such) either breaks open new fields, changes our view on existing fields, or sets aside old truth that hereinafter is not really true any more. It creates novel knowledge. This goes without question. Of course new knowledge must bring something new. In the scientific community most research forms a small part of new knowledge. These bits of knowledge are published to colleagues in peer-reviewed journals, where they add up to a giant jigsaw puzzle of knowledge. Most findings make incremental additions to the whole, but occasionally a researcher sees a new pattern in the puzzle and creates a major new finding. What is of interest here is the fact that, by and large, the community of design works in the same way: Innovations and new forms of design and architecture are published in journals with professional/expert editors and every new contribution is acknowledged

and debated by the design community. Most contributions are incremental; they add some new feature to the already known, but every now and then a remarkable innovation is published. When Bertoia's chair came out, it was radical news to construct a comfortable chair with the technology used for supermarket shopping carts and baskets. Jørn Utzon's Sydney Opera House showed a completely new approach to the design of large theatre buildings. And Juicy Salif opened the notion of function from the utilitarian view to a more elaborate one; the juice being staged to create a sensual experience.

Ottersen's second pillar, *relevance*, is somewhat obvious. The new must be relevant. It is of course possible to construct brand new, original knowledge that is completely irrelevant. Such contributions must be filtered out, and it goes without saying, that the more relevant a knowledge contribution is, the better. Now, does this criterion – relevance – seem to have parallels in design? Are design innovations judged partly on the relevance they seem to have for users, society, and so on? I would say yes, indeed. Both in science and in design innovation the new and relevant is likely to influence the scientific or the design community respectively. In science this is measured for instance by quotations, in design innovation for instance through copying and piracy. Among designers it is said that it is an honour to have your design copied. The meaning of course is that it proves you brought something new and relevant to the scene.

Bertoia's chair proved relevant as a light, airy approach to furniture and it has influenced furniture design for more than 50 years. Utzon's entry for the competition for the Sydney opera house was a simple but highly relevant scheme: Since Sydney is situated on hills around the harbour, the new opera house would be seen from all angles, including from above. Utzon's design solves this in one very powerful form, a form that has become an icon of a continent. And Juicy Salif showed a relevant way out of the purely instrumental approach to daily routine utensils, introducing humour and sensuality. As we now know, it became an icon of the 1990s.

The third and last pillar, *solidity*, is somewhat more tricky. In Ottersen's approach – seen from his specific position in the natural sciences – solidity means for instance valid statistics; to have a sufficient set of statistical data to support correlations and conclusions. Furthermore, he says,



Figure 2. Sydney Opera House, 1957, exterior detail. Photo by Michael Asgaard Andersen, published with permission.

it means that results can be validated or falsified by other researchers doing the same experiments. These issues do not have much say in design. Statistics is not a major tool in design and usually one wants a good design to be difficult for others to copy. In fact, statistics is not a major tool in science as such. Different scientific areas use different scientific methods. So the criterion *solidity* seems to be field specific. Ottersen's paper has a third and more general explanation as to what is meant by solidity in research: "How the research is carried out". What does this mean? Well, a good report on science, albeit that science is concerned with society or with phenomena of nature, must be very thorough in its methods, analysis, and conclusion. It must seek to criticise itself, only to construct a clearer argument. Such care and precision is the craft of science. At a general level, we see that solidity is about building arguments that are valid, transparent, and well grounded, to have sufficient base for conclusions and that conclusions in turn follow inevitably from arguments. Solidity means to state an argument that cannot be opened or rearranged to lead to a different conclusion. It is coherent. It is solid.

#### **ON THE SILENT KNOWLEDGE OF DESIGN EXPERIENCE OR THE CONSTRUCTION OF IMPLICIT KNOWLEDGE**

Design in the sense spoken of here is not science. Rather it is art. Harry Bertoina was a sculptor, which is clear to see in his designs for Knoll Inc. Jørn Utzon

has been internationally renowned as one of the great artists of the twentieth century, and the Sydney Opera House is on the UNESCO list of world heritage. Philippe Starck is appointed "Commandeur de l'Ordre des Arts et des Lettres" alongside David Bowie, Paul Auster, and other great artists. So for a clue to what solidity would mean in the context of design, let us turn to art theory; not to the specific art theory that looks deep into one artistic field, a specific period of time, or part of the geography. But a small and simple art theory, constructed right here for practical purposes and furthermore one that covers largely any artistic field. This might sound hazardous, but what is needed here is not much more than to uncover what it is that moves a creative activity from skilled manipulations to artistic manoeuvres, and we will refer this theory to a few solid works of Western art theory.

Let us first consider the nature of art. What is it that an artist does? Well, think of a free, unconstricted auteur-artist, one who doesn't take upon him/herself a job for others but acts entirely out of his (or her) own will. We can consider such a person, this artist, as constricted by, or working within the confinements of, only two things: his/her material and his/her idea.

The *material* – matter, stuff, or medium – is a basic condition for any art: For the singer his or her own voice is the material, for the painter the available physical colours and canvasses are the materials, and for the poet language is the material. Material is



what is formed by the artistic process and this form is the work of art. So in any case the artist must master his/her material.

The second basic condition is *idea*, a notion which signifies the demand that a work of art must be more than a material with a shape. Idea is what elevates and animates the material through the gesture of form; the idea ultimately turns the work of art into something more than what is simply skilful. Everyone can tell when a piece of music is performed virtuously, and when it is performed tunefully. The first we can admire for virtuosity and technique, the second can touch deeper levels of our minds. So *idea* as spoken of here is not a simple little thing anybody instantly makes two of, but rather it denotes artistic elevation as such.

For the works of art in question, design and architecture, a third parameter of basic condition or confine is present: The concept of *programme*. The programme is a placeholder for the utilitarian aspect of industrial design as well as that of architecture. The programme for a building could be a list of the specific spaces and activities the building must accommodate. For an industrial product the programme could be a list of functions the product must serve. In general, the programme signifies the grounds and offset for the design task.

With these three parameters – parallel to those introduced by Vitruvius (Vitruvius, c.50 BC): *firmitas* (the material), *utilitas* (the useful) and *venustas* (the beautiful) – the basic elements of any design process are covered: The design process is about interpreting, answering, and materialising the programme, and on the way to doing this to invest both programme and material with *idea*. In the design process it is these three elements that struggle: the materials at hand; in general terms the physical realities of hardware, gravity, and the like, be it industrial fabrication or building technology. The programme to be interpreted, be it a chair, a house, or a kitchen utensil. And finally idea: the demand that the final design must be more than its components. In the design process any designer, a first-year design student or the mature architect running a 100-employee office, faces the same basic problem and uses the same basic method to solve the problem. The problem of how to more than fulfil the programme – “more” in the sense that mere function is not sufficient – with no more than the means at hand. The method used is the iterative sketching process: Different schemes and

ideas are tested and evaluated through drawing and modelling in a process not unlike that of scientific experimentation.

The artist must channel the idea, the “more”, through the material. Otherwise it is not a work of art, but something else – a statement of a possible idea, for instance. Art that develops when forming the material in itself and supported by no other, outside means enables the artistic material to hold more meaning, more sensuous pleasure, more *idea* than the simply skilful treatment of the material. What is a crucial point here is the fact that the material in itself and by the specific way in which it is treated and shaped by the artist holds this information. The extras of the idea are not applied onto the material; they are embedded in the material. This embodied richness of information is what design theorists have spoken of when suggesting seeing designed artefacts as being a language (Cross, 2006), as rhetorics; as the construction of solid argument (Buchanan, 1989); or as a bearer of meaning (Krippendorf, 2006). And such embodied richness is a core notion in any dispute on art. A classical and very elaborate example is Soren Kierkegaard’s analysis of Mozart’s opera Don Giovanni (Kierkegaard, 1843/1987).

This embedded extra information brings us back to the question of solidity. *Solidity* in Ottersen’s terms thus equals what in art debate often is referred to as *density*, a term signifying simultaneous *richness* and *coherence*: The work of art must be coherent in order to embed multifaceted information, the quality of which in turn should be as rich as possible. The parallel can be extended when we consider how

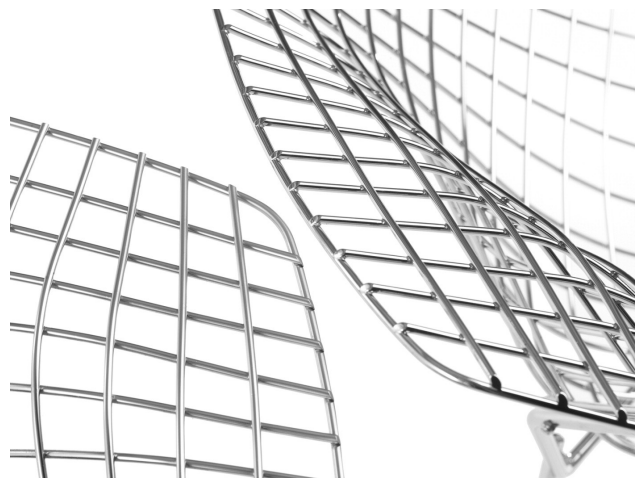


Figure 3. Bertoia Diamond chair, 1952, detail. Image by Knoll Inc., published with permission.

the question of solidity in any research statement, article, or report is actually evaluated in the scientific community. It is by critique. Critique, first from the scientist him/herself, who hesitates on jumping to conclusions, but keeps an open eye for holes in his/her argument, and second from colleagues who might have different interpretations of data and definitely will scrutinise the material for any deficiencies. Critique is something that is by no means alien to the artistic field. And at the heart of any aesthetic critique, be it the teacher's comments to a student's work or the newspaper critique of a new motion picture, is the question of *consistency*. In any better work all sensuous and logical elements are mastered and aligned to fit in the whole (again we can refer to Søren Kierkegaard for a full description). No element must be left out to live its own life and be replaceable with something else. The work must close upon itself.

Coming back to the question of the nature of the knowledge embedded in material artefacts we have seen that such knowledge is constructed and criticised in fora and institutions parallel to those of scientific contributions. The basic criteria for evaluation also parallel those of science, and could for instance be *originality*, incremental or groundbreaking, *relevance*, for the field or for society, and finally *solidity*, a field-specific notion that in design can be seen as a certain *density* of information, as *richness* paired with *coherence*.

Bertoia's chair was hot, relevant news in 1952. But the density in his work, the richness and the coherence, how can that be seen? The full story on that is too long to disclose here. But in short we could say that, on a semantic level, Bertoia's design talks about a new, free space. A space that is light, airy, continuous, and organically curved. And on the level of syntax his chair achieves all that only by means of pursuing the formal and technical possibilities of the steel rod. And on the level of phonetics – to perhaps push the linguistic metaphor a bit far – every joint and member is carefully handled, both as part of the overall composition, and as part of the technical and tactile structure. So this only one, new idea – which is what you instantly see and interpret when confronted with the chair, namely the “supermarket-basket chair” – holds all that information. Much the same is the case with the Sydney Opera House. On the highest level it evokes collective human emotions pertaining to nature and ancient cathedrals. And on the detailed level it is covered with a custom-invented and

very beautiful tile cladding. Yet it is none of these things only. Not reference to nature, not reference to cathedral, not just inventive. It just is. It remains so immensely dense in the way all aspects of its creation and interpretation are derived from one singular, very rich, and very coherent idea. So light in matter. So solid in intellectual construction.

And Juicy Salif? Well, it belongs to a less permanent field of material culture. Yet a multitude of emotional, perceptual, technical, communicative, and other aspects are aligned and materialised in this small, monolithic object. You probably won't succeed in changing any detail of it. It wouldn't be Juicy Salif any more.

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