Chapter 10
Why Design Cybernetics?

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Abstract In this chapter I review the intimate relationship between cybernetics and design, drawing on the work of Ranulph Glanville and Gordon Pask. The significance of each of these fields for the other follows from the mutualism between them, such that cybernetics can be understood in terms of design as well as vice versa. The full value of this can be seen in the assistance they offer each other in building support from within. Design may serve as an example for how cybernetics can be practiced *cybernetically*, i.e. in accordance with its own insights and principles. In turn, cybernetics may help design understand itself in its own terms, in contrast to the way that it can become distorted by theories imported from elsewhere. Moreover, this mutualism connects design research to the vast array of topics with which cybernetics is concerned. Recalling its origins as a transdisciplinary project, cybernetics may help mediate diverse concerns within design, while also enabling cybernetic processes in other fields to be explored through the insights and methods of design research.

10.1 Introduction: Cybernetics and Design

In recent years there has been a resurgence of interest in cybernetics amongst designers. It has acted as a point of reference for various contemporary concerns, including the expanding possibilities of technology, the systemic complexity of contemporary design questions, the status of design as a discipline, and the relationship between design and research. These issues recall debates in design during the 1960s and 1970s when cybernetics, which was then a much more prominent discipline, was invoked in relation to the emergence of computing and the study of design methods. There is a rich history of overlap between the two fields from that earlier period. In particular, the British cyberneticians Ross Ashby and Gordon Pask both engaged directly with design, influencing theorists such as Christopher Alexander, Bruce Archer and Horst Rittel. Pask contributed to the field of architecture, collaborating with Cedric Price and Nicholas Negroponte and influencing the development of interactive architecture through the work of Julia and John Frazer and his own highly original installations.

As Pask notes in the context of architecture, while there are many ways in which designers might "dive into a cybernetic bag of tricks and draw out those that seem appropriate," the two fields "really enjoy a much more intimate relationship" [30, p. 494]. The past decade has seen the connections between cybernetics and design become more apparent,[1] a process that can be credited in large part to the work of Ranulph Glanville. Glanville's efforts to consolidate the relationship between the two fields include his guest-editing of the 2007 *Cybernetics and Design* special double issue of the journal *Kybernetes*, on which I worked as a research assistant [8]. This special issue contained articles by a number of contributors to the present publication [2, 23, 26, 27], as well as Glanville's *Try again. Fail again. Fail better—the Cybernetics in Design and the Design in* Cybernetics [10], which is reprinted here in Chapter 1. Glanville's paper served twin purposes: (1) introducing cyberneticians and designers to each other's discipline and (2) articulating his own understanding of what is shared between

[1] The same period has seen a similar deepening of connections between design and the field of systems, which is closely related to cybernetics [24, 25].

them.

The special issue took the form of a survey of different perspectives. The collection was not intended to be definitive, but to open up a further area of research. As Glanville put it in the introduction, the aim was:

> …to start an exploration which would be as clear and explicit as possible, beginning to develop any relationships that might exist between the two fields of design and cybernetics. The idea was to build the bridges, to find mutualism. [9, p. 1153]

Mutualism was also stressed in the call for papers, which included the following questions:

1) How does cybernetics throw light on design, and lead to developments and improvements in our understanding of and ability to act in design?
2) How does design inform us in our understanding of cybernetics and its potential to parallel and throw light on design?
3) What is the mutualism that may hold between them when questions 1) and 2) are seen as part of the same whole? [9, pp. 1153-1154]

I see the mutualism between design and cybernetics as a way of responding to a question that can be asked of the present volume as a whole: what is it that cybernetics can contribute to design and design research beyond being yet one more vantage point or approach amongst others? Glanville's [14] seminal paper on the relationship between design and research asked a similar question—*Why Design Research?* There, in an argument I briefly summarise below, the importance of design research is seen to follow from understanding research as a form of design activity (hence the dual meaning of its title, which I echo in the title of this Chapter). Similarly, the value of *design cybernetics* follows from the substantial overlaps between the two fields, where cybernetics may be understood in terms of design as well as vice versa. Below, I recount two prominent ways in which this mutualism has been understood. One, put forward by Glanville [10, 11], understands design activity as an example of the sort of conversational processes with which cybernetics is concerned. The other, put forward by Pask [30] in the context of architecture, stresses the outcomes of design activity, to which cybernetics is relevant in a number of ways. While both Pask and Glanville offer reasons why design cybernetics is worth pursuing, the case for this may be strengthened where their accounts are understood in combination. Taken together, they suggest novel configurations for design research that recall cybernetics' original formation as a radical transdisciplinary project.

10.2 Design and Conversation

Conversational processes are central to both design and cybernetics, and are one way of establishing connections between the two fields. Design is often understood in terms of conversation, such as in Donald Schön's [36, p. 76] characterisation of design as a "reflective conversation with the situation". The interaction present in conversation is a prominent example of the sort of process with which cybernetics is concerned, most notably in the work of Pask [31]. Glanville [10, 11] aligns cybernetics and design by establishing a close analogy between Pask's understanding of conversation and the core design activity of sketching, where designers develop ideas quickly through drawing.

Both conversation and sketching have a circular form, with participants shifting perspective between looking and drawing, listening and speaking. Just as conversation tends to lead to places we could not have predicted in advance, so too this aspect of the way designers work helps them create new possibilities. This is crucial for design, given that it is, at heart, a process of transforming existing situations into new ones. The tendency towards the new in a conversation follows from the way that meanings are not transferred between participants. Participants construct their own understanding of the understanding of others, with the process taking the recursive form of "what I think of what you think I think, etc." [5, p. 217]. For instance, if, in a simple conversation between myself and someone else, I begin by presenting some idea, the other participant does not have this transferred

directly to them but builds their own understanding of what it is that I mean. They then present what they have understood back to me and, again, I construct my own understanding of their presentation. I can then compare this understanding—what I understand of what they understood—to what I originally meant to communicate (see the diagram given in [11, p. 432], and figure **??** in this volume). Even if we continue this process in order to align these understandings, they remain separately constructed. Conversation preserves and is preserved by this difference such that it involves the construction of new understanding at every turn, in contrast to the way coded communication involves the transference of an unchanged message. New ideas are created through this exchange, whether directly from our understanding of the ideas that are shared with us; through misunderstanding, where we see a worthwhile idea in what someone says that was not intended; or where we learn what is implied by our own ideas through understanding how they are interpreted and understood by others.

Similarly to the combination of speaking and listening in conversation, design combines the making of proposals with evaluating and understanding them. The circular process formed by these two aspects is more than one of iterative improvement or optimisation against set goals or criteria. Just as conversation can change course or develop new questions to explore rather than just leading to agreement, designers review and revise not just their proposals but also their understanding of the situation for which these proposals are intended. This can be seen in the characteristic design activity of sketching, which Glanville takes as embodying what is distinctive about design more generally. When sketching, designers simultaneously play the roles of speaker (drawing) and listener (looking), continuously switching between the two. By externalising their thoughts through a medium, designers see more in what they have drawn than they originally intended or understood [10, p. 1189]. This might include new possibilities for proposals or new aspects of the situation that need to be taken into account. While there are many other aspects to design, it is this type of conversational process that makes design so distinctive as an approach to the sort of complex, ill-defined and ambiguous situations that designers encounter, where more conventional forms of problem solving are inapplicable.

10.3 Mutual Support

The commonalities between cybernetics and design are such that they substantially overlap one another. Glanville characterises their relationship as one of mutual support to the extent that "cybernetics is the theory of design and design is the action of cybernetics" [10, p. 1178]. The significance of this mutualism for Glanville can be contextualised by recalling his [6, 14] influential argument about the relationship between design and research. During the period of scientific and technological optimism that followed the Second World War, there was a tendency to see design as something that should be put on rational scientific foundations. As Glanville recounts, this largely failed to recognise what was valuable about design activity itself:

> When Design Research began, say in the 1960s, the eventual success of science was assumed. Already, at the notorious 1956 Oxford Conference, architectural education in the UK (and its sphere of influence) accepted architecture was a second class subject: i.e. not properly scientific. Science (in actuality, technology) was seen as so successful that everything should be scientific: the philosopher's stone! Architects (a significant subdivision of designers) were determined to become scientific. The syllabus was changed and design science was invented. Even the Architectural Association School gave over a third of undergraduate time to design science. Prime Minister Wilson and his Government declared the 'White Heat of the Technological Revolution.'
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> It was no wonder design was seen not as a discipline in its own right. Design was deficient: effectively, a defective science. It was flawed. But these flaws could be fixed by the proper application of scientific methods. [6, p. 80]

In his *Why Design Research?* paper at the 1980 conference of the Design Research Society [14], later expanded as the journal article *Researching Design*

and Designing Research from which the above quotation is taken [6], Glanville made the radical proposal to invert this hierarchy. Rather than seeing design research as one specific form of scientific research, or design as an activity to be corrected by science, Glanville argues that, instead, we can see science as a specific form of design enquiry. This follows from the way that scientific research inevitably involves design activity, for instance in devising and setting up experiments, but not vice versa. This is not to say that designers do not make use of scientific research but that doing so is not essential to what design is, whereas design is a core aspect of conducting research and so science. Design is, it follows, the more general case and, therefore:

> ...it is inappropriate to require design to be 'scientific': for scientific research is a subset (a restricted form) of design, and we do not generally require the set of a subset to act as the sub subset to that subset any more than we require [that] the basement of [a] building is its attic. [6, pp. 87-88]

Rather than seeing design as something to be corrected by science, we might therefore look to design to inform the practice of scientific research. Indeed, the parallels between design and research are such that Glanville suggests seeing the field of design research as a self-reflexive activity of *researching research* [14, pp. 116-119]. That is, as design is a core part of research, to research design is to inquire into an aspect of research activity itself.[2]

This stands in contrast to the recurring tendency for theories to be imported into design from elsewhere, whether from science or other fields. While there are many benefits to such exchange, there is the risk of what is special about design itself becoming lost or distorted in the process [13]. In arguing that design and cybernetics substantially coincide, Glanville positions them as able to mutually assist each other in building support *from within*. In contrast to the way that designers tend to invoke theory in order to change design practice, the value of cybernetics for design is in helping *sustain* and *deepen* those aspects of design activity that are distinctive about it. This is not to say that design should isolate itself, but that it needs to maintain its own identity in engaging with other domains. Indeed, to understand design in cybernetic terms is to do so as a transdisciplinary project (more on this below).

Design can, in turn, play a complementary role in supporting cybernetics. At the inaugural conference of the American Society for Cybernetics (ASC), Margaret Mead [28] challenged the ASC to apply the ideas of the field to the organisation of the society itself. Just as what is special about design has sometimes become lost where it is not understood in its own terms, so too what is special about cybernetics is difficult to maintain within the context of conventional science. Glanville took Mead's challenge as a focus of his time as president of the ASC (2009–2014), a theme he addressed in part through developing conversational (i.e. cybernetic) formats for the society's conferences [12, 15, 41, 43]. The principle legacy of Mead's remarks has been the development of second-order cybernetics (the cybernetics of cybernetics) by Heinz von Foerster and others. This has been largely philosophical in orientation, critiquing the exclusion of the observer in conventional approaches to science. Glanville's direct response to the specific context of Mead's challenge offers a more practical interpretation, recognising the importance for cybernetics of conducting itself in accordance with its own ideas and values. Glanville's concern with the relationship between design and cybernetics can be understood as part of this same project, with design contributing an example of how cybernetic ideas may be explored in cybernetic ways.

10.4 Design Cybernetics as a Transdisciplinary Project

Although Glanville's account of the mutuality between design and cybernetics is heavily indebted to Pask (who was his mentor), Pask's own way of establishing

[2] In so doing, Glanville anticipates recent discussions regarding second-order science [29, 38].

the closeness of cybernetics and design takes a different form. While Glanville focuses on parallels between cybernetic and designerly *processes*, and so on the activities of designers, Pask stresses the relevance of cybernetics to the *outcomes* of design activity. Even where these outcomes are physical, such as in architecture, they may also be understood as systemic:

> ...a building cannot be viewed simply in isolation. It is only meaningful as a human environment...In other words structures make sense as parts of larger systems that include human components and the architect is primarily concerned with these larger systems; they (not just the bricks and mortar part) are what architects design. [30, p. 494]

Focusing on architecture, Pask describes the novel and complex challenges that arose during the nineteenth century, with new building typologies such as railway stations leading to questions beyond the scope of previous architectural theory:

> Whereas the pure architecture of the early 1800s had a metalanguage, albeit a restrictive one which discouraged innovation, the new (augmented) architecture had not yet developed one...In place of a general theory there were subtheories dealing with isolated facets of the field; for example, theories of materials, of symmetry, of human commitment and responsibility, of craftsmanship and the like. But (it is probably fair to say) these sub-theories developed more or less independently during the late 1800s. [30, p. 494]

A similar tendency to understand architecture piecemeal is recognisable today. This follows in part from the breadth of the discipline. The field of architecture involves the humanities and applied sciences as well as designerly thinking. Moreover, the buildings architects design have consequences that range across all aspects of our lives. There is, therefore, a vast range of perspectives that can be brought to bear on any one architectural question. Depending which aspects one sees as being primary, one might look in very different directions for theoretical support, and it is seldom clear how to mediate between the rival frameworks and agendas that one encounters. While such differences can be productive, not least in the way that they can help sustain conversation (as discussed above), the relations between different aspects and approaches are often fraught or unexplored.[3]

Thus, while interdisciplinarity is often thought about in terms of collaborations across traditional boundaries, there is a similar need for such exchange *within* design fields such as architecture, between different sub-fields and foci. Pask puts cybernetics forward as a possible "underpinning and unifying theory" [30, p. 494] for such a task, a suggestion that recalls cybernetics' origins as a transdisciplinary language. Indeed, the work of cyberneticians has been a point of reference for a diverse array of contemporary issues in architecture and design, including: the digital, networked and interactive technologies that are increasingly a part of both what and how we design, e.g. [3, 4, 16, 34, 37, 42]; the epistemology of the design process and its relation to research, e.g. [10, 13, 23, 38]; ecological and systemic concerns, e.g. [17, 20, 25, 35]; cognition and spatial experience, e.g. [21, 22]; design education, e.g. [18-20]; and social and ethical considerations, e.g. [1, 33, 40]. While these various invocations of cybernetics have value independently of each other, the potential of design cybernetics as a whole is that diverse areas of action and discourse such as these may be brought into closer relation with each other. This may help mediate between different agendas, as well as allowing for new questions to be asked.

While the ways in which Pask and Glanville connect cybernetics with design pull in different directions, they also complement each other. Glanville's account of the design process is an example of cybernetics informing a specific area of design, giving support to the idea that cybernetics can play a unifying theoretical role. At the same time, the wider relevance of cybernetics that Pask points to can reinforce Glanville's project of understanding and practicing design and cybernetics in their own terms.

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[3] Alessandro Zambelli [44, pp. 107-110] has speculated about a possible root of some of these tensions in the foundation of the RIBA and in 18th and 19th century disciplinary specialisation more generally.

Glanville establishes a symmetry between cybernetics and design, such that cybernetics may be understood in terms of design as well as vice versa. Thus, where design looks to aspects of cybernetic insight for support, it can equally be understood *as looking to itself*. As well as helping avoid the risk that design's strengths become distorted in its engagement with other areas of discourse, this symmetry broadens the domain in which designerly thinking can find application. Because cybernetic processes can be understood in terms of design, the insights and methods of design research can be used to explore cybernetic topics in other fields. That is, as well as cybernetics' potential as a transdisciplinary framework *within* design, design may also reach out *through* cybernetics in order to contribute to the vast array of subject areas with which cybernetics, in turn, is engaged. Examples of this include Glanville's understanding of research as a form of design activity [6, 14], and his generalization of this argument in terms of mentation [7]. My own work on design and ethics can also be thought of in this way, with cybernetics enabling design to inform ethical questions as well as vice versa [39, 40].

The relevance of design to cybernetics can be understood in terms of a broader agenda of recovering and enhancing cybernetics as a field. Cybernetics' ability to play a transdisciplinary role comes at the cost of its own tendency towards abstraction. There are therefore limitations to what cybernetics alone can offer in the context of more situated, material, and political issues. These limitations can be countered by emphasising the more tangible qualities of cybernetics itself, such as the experimental devices and installations through which Pask and others developed their ideas [32, 38]. They may also be addressed by developing cybernetics' partnerships with more situated fields, such as its mutualism with design. As such, design cybernetics may be understood *not only* in terms of bringing cybernetic insight to design and design research, *but also* in terms of design's contribution to cybernetics as a transdisciplinary project. The value of this task can be seen in the way that many of the profound and urgent questions we presently face (in design and elsewhere) combine some of the various technological, systemic, and epistemological issues to which cybernetics speaks.

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