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How design and cybernetics reflect each other

Glanville, Ranulph

How Design and Cybernetics Reflect Each Other

Ranulph Glanville

Keynote address delivered by Ranulph Glanville at the RSD3 2014 Symposium Relating Systems Thinking & Design 3 on October 15, 2014 at the Oslo School of Architecture and Design. Transcript by Thomas Fischer, Timothy Jachna and Albert Mueller, with an introduction by Aartje Hulstein.

Ranulph started off this talk mentioning that his dropping-in on, and participating in some of the preceding day's workshops prompted him to re-think the talk. This involved revisiting his argument and writing new cards with notes, first in the evening and then again until we left our hotel in the morning. Ranulph was very pleased and surprised to find Thomas Fischer and Timothy Jachna in the lecture hall, setting up so the talk would be video-recorded (it is available on the YouTube channel of the American Society for Cybernetics[1]), with kind support from Birger Sevaldson. I remember the wonderful feeling we all had when Ranulph finished. It was one of the most concise arguments linking cybernetics and design he had ever given. Ranulph died on the 20th of December, 2014. When Tom, Tim, Albert and I collaborated on this transcript in February, the memories came back to me. I realized that something was missing: Ranulph telling me he had to rework it. He used to say that words spoken in the presence of others are not the same as text written down in a transcript. It would have to be carefully transformed and revised, as he had done in the past with other talks. This time he did not have the time to do this. It might be an interesting experiment to imagine how Ranulph would have changed this transcript. Not being in a position to re-work this text as Ranulph would have done, we have made no such attempt. Nonetheless, we wish to make it clear this is what would have happened, had Ranulph had the time. We have merely added references to some of Ranulph's own writings and to texts of authors he mentions in the talk, hoping that this will facilitate others who study Ranulph's work on the intersection of design and cybernetics.

Aartje Hulstein

February 2015

[1] *http://www.youtube.com/watch?v=tTN_9mJIWNw*

I enjoyed yesterday afternoon, dropping in on a couple of the workshops, and I enjoyed it for a number of reasons. But one was that it helped me understand who was here, and so it caused me to go away and re-think everything that I was going to say today.

I'll still probably offend everyone because with three separate groups of interest and levels of understanding and areas of understanding and so on you're going to get something wrong for everyone at some point. And I may also offend you because I believe that things should be said as simply as you possibly can. In the Design Museum in London – in the old building, not the new one – they painted on the wall a quote from Bruno Munari the Italian designer who said, "Design is simplifying, not complicating". And I think, you know, when we are faced with the complexity of the world there are essentially two sorts of approaches. My wonderful professor Gordon Pask had one approach, which was to grab everything and keep shoveling it in and to collect everything, and then say he'd got everything. And one of the reasons that Gordon and I got on so well is that we had such different styles we didn't really understand each other. And so my approach is to try to strip it down, and I'll really be happy when there is nothing to say about nothing, [laughter from the audience] and that's a way of doing everything. So I may appear to oversimplify. This is intentional and possibly offensive.

Good. I noticed that there seem to be more people here who use the word "systems" than "cybernetics", although yesterday there were a lot of people using the word cybernetics – it was really nice. I felt cozy and at home. But I thought that one of the things I should do is try to make a little difference between cybernetics and systems, or see if there is one. And then I should say a few words about cybernetics and systems, as the word that is used in the title here and used I think by the majority of people here. And then I would say a few words about design because I am sure that each of us means something different by it. So before I try to say that design and cybernetics are really the same thing – which is what I'll end up doing in a sort of limited way – before I say that I'd really better explain to you what I understand design to be in as far as I can, because it won't be the same as many of you think.

So, and it was always my intention to do this without slides. Carl Bass, who is the CEO of Autodesk, was asked why he never used slides and he said, "Because if I use slides you look at the eye candy and you don't listen to what I am saying." So I think slides, PowerPoints and so on are actually mostly very destructive and very distracting and they stop you from improvising, they absolutely pre-program everything. It is very difficult to escape from their plodding continuity. And I rather like an Australian speechwriter called Don Watson who wrote a book called *Weasel Words* (Watson, 2004). This is a wonderful book of clichés from management jargon and such like. And in it he has both "bullet point" and "PowerPoint". Hmmm. And he says about PowerPoint, "PowerPoint is a medium for presenting holiday snaps and for presenting assertions as if they were arguments", both of which seem to me to be true. That's not to say everyone does this. I am sure that each one of you is amongst the wonderful team of exceptional people [laughter] and I know that some of you make

slides that are so stunningly beautiful that it's worth having the eye candy regardless of their excellence.

OK, so that's enough preliminary. There are these two words, aren't there, cybernetics and systems. And if you belong, if you go to the world of meetings of systems groups and cybernetics groups, you'll find they're very antagonistic very often. I've spent the last six years with the American Society for Cybernetics buddying up to the International Society for the Systems Sciences. We used to feel enormously threatened by each other. We used to think that each was trying to take over the other, and it's not necessary to behave like that. It's a sort of juvenile behavior. So I would like to look at these two words just briefly and try to find out whether it matters that there are two words or not.

Cybernetics in its modern usage came about in 1948. A man called Norbert Wiener published a book called *Cybernetics or Communication and Control in the Animal and the Machine* (Wiener, 1948). About seven years later he published the second edition of a book called *The Human Use of Human Beings* (Wiener, 1954), which is actually the book he should have published first. And an enormous amount of the misunderstanding about cybernetics and systems would not have happened if Wiener had published that book first. *Cybernetics* is a mathematical, technical book, which makes cybernetics look like an engineering subject. *The Human Use of Human Beings* shows that it's a way of thinking and a way of being in the world, which is a quite different sort of proposition. So, Wiener was sort of at fault there (Glanville, 2012a, p. 32). Nevertheless, he published this book and then a year later Ludwig von Bertalanffy published a book called *General System Theory* (von Bertalanffy, 1969). I don't think there is anything very particular in these dates but a lot of the argument about cybernetics or systems depends on people saying: "We were first! We were first! You weren't! Go away! Horrible, you're stealing my stuff!" Well, actually both of them have been around for a very long time. Cybernetics goes back to Aristotle who used the word, so that's two and a half thousand years or so. And Aristotle, being Greek, used the Greek word in the Greek way, meaning helmsman or steersman: that is the person who sits at the back of the boat and gets it to the right place (Glanville, 1997, p. 7). And a system is, I mean if I talk about cybernetics I end up talking about cybernetic systems. So the two go together in that sort of sense.

I think there is a difference between them. I think cybernetics tends to be more abstract and systems tends to be more pragmatic. But that doesn't seem to me to be a reason for squabbling. And indeed a lot of the people at least in cybernetics said it really doesn't matter which word you use. So I'm going to use the word cybernetics where you use the word systems, and you're going to use the word systems where I use the word cybernetics. And we're going to mean more or less the same thing. If there is a difference, I think the difference is – there is the one of abstract versus pragmatic or something like that – and there is I think a second useful difference, which is a differentiation made by a man called Charles François, a Belgian who lives in Argentina, who composed an extraordinary *International Encyclopedia of Systems and Cybernetics* (François, 1997). You know, it's one of those five hundred dollar books that your library can't afford but it's a very extraordinary book. And his position – and he is in a good position to have a position – is that cybernetics is the

dynamic complement of systems. Yesterday there were a number of diagrams around, very typical sort of systems diagrams with boxes here and here and here and here and arrows connecting them. You know, a typical systems thing. And François would say, "Systems people are interested in the boxes and cybernetics people are interested in the arrows." And that's quite possibly it.

Good. That's got that out of the way, I think [laughter]. Excellent. I've also got my cards [with notes] out of order. I imagine that all of you ride a bicycle, drive a car, or steer a sailing boat. Would that be fair? All of you do something like that? Yeah. And I imagine that you've done something like this: You've looked straight ahead and said: "I don't have to adjust the handle bars. I'm just gonna go straight ahead!" Or the steering wheel, or the tiller. You're just gonna go straight ahead, and you're gonna go straight down that road, and if you don't move anything, within about a hundred or two hundred meters you're off the road. Yeah? If you don't adjust the tiller you're no longer pointing to that lighthouse, but you're pointing to some fishing hut over there (Glanville, 1997). You all know this experience. Steering is a difficult thing to do. You can't just point something because the world is full of surprises and errors and things that don't quite work as we think they do, that don't quite match the model we have of how the world is. Yeah? So, when we steer we don't just point somewhere and go. We all the time have ways of adjusting what we're doing. We're all the time accommodating for little errors that come about for all sorts of reasons, and they're not really important but I suppose most of all they come around because models of the world are not the world. So our imagination of how the world works is not how the world works. It's our imagination of it. And I don't want to get into "How does the world work, how do we know?", that sort of thing – I am trying to avoid that.

So, what cybernetics is based on is two very surprising things. First of all, it's based on error. Cybernetics is the subject that says, "We accept that error is endemic. There is always error." The question is not to eradicate error, but how do we manage error, how do we live with error? Because there is always error (Glanville, 2007, p. 1181). And of course one of the ways we live with error is we turn it into opportunity. That's a really good way of living with error. The other thing about cybernetics is that it's responsive. Cybernetics doesn't initiate, it responds to situations we find ourselves in. So, I'm steering this path, I find that I am no longer pointing where I thought I would be pointing because there's been a gust of wind or there's a little bit of funny stuff going on in the sea, or whatever it is, and I have to adjust. I respond to that change in situation and adjust and we continue.

Now, the form of this process – well, the name given to it usually is "feedback". I don't happen to like to word feedback because it suggests that it is something very tiny that's going back to something that's sort of big and chunky. So, I prefer the word circularity, because cybernetic systems are not systems that are interested in energy. They're interested in information. Ashby, Ross Ashby, who was one of the great founding fathers of cybernetics and who wrote what is still the best introductory book to the subject, the astonishing *Introduction to Cybernetics* (Ashby, 1956). And he reminded us in that book that cybernetic systems are not subject to the laws of physics, to energetics, they're subject to the laws of information, so they're concerned with messages. And what I get when I am

steering is I see that I'm going wrong, and send a message to adjust the tiller. So there is a circularity there: I want to go somewhere and I sense whether I am still going there and if I'm not I adjust something and I am going there again.

Let me switch examples to another very common, very simple cybernetic system: the thermostat. We all know the thermostat, thank goodness for it. And look, there's one over there [points to thermostat controller on the wall across the room]. You see that white thing there on the wall? I think that's probably a thermostat. Now, we all know the thermostat. You set it to a particular temperature and when the room gets a bit cold – 'cause we're in cold countries, aren't we? – it turns on some central heating device, a furnace, some hot air, some warm water, whatever it is, a bit of electricity heating wires in the floor, however it's done, and the space in the room heats up until it exceeds the temperature that we have set and then it turns things off. And that is clearly a circular system. There are two components; there's a switch on the wall and there's a heat supply system and one controls the other, doesn't it? So, you'd all agree that the switch controls the furnace and what have you. And you'd actually be wrong to agree, because you have to say to yourself well, what is it that controls the switch? And the answer is the furnace providing the hot air or whatever, yeah, the furnace heating the room (Glanville, 1997; 2000). And that says that in a circular system things like control are not as we have thought of them one thing controlling another. The control is caught by the interaction of the two components balancing each other, and each is the controller of the other. It's a very strange concept, this. Whenever I introduce it to people they're very shocked: "What do you mean the furnace is… that switch is controlling things!" And I've have always wondered why we position things in this sort of power relationship, this linear thing about control, and someone suggested to me that it was actually because we think of the energy (Glanville, 2002, p. 4). And that's the reason I don't like to use feedback as the word, but use circularity because feedback sort of has that energy notion in it.

OK, now let me suggest that we change a word here, and instead of talking about the switch "controlling", let me talk about the switch "observing." Observing is also a word I am trying to get rid of at the moment but I'll use it because everyone knows it. And what the switch does is it observes the environment. Yeah, you'd probably think that was OK. In the scientific sense it observes the environment. You might find it hard to think of the furnace observing the environment, but it sort of does. But what I think is interesting is that in a circular system we're talking not about one thing observing the other, but both observing each other. Now I'd like you to think of this system: Here is my switch and here is my furnace. I'd like to shrink these down, put a box around them and treat them as one, so there we are, that's the whole of this, just hold that in there, and I'd like to ask you this question: Here I am as an observer, and I want to observe this thing what happens to be a thermostatic system which we've been talking about. Now, this thermostatic system is observing circularly, yeah? What I want to know is, how should I observe this system? Well, the traditional way would be I'd sort of stand above it and look at it, not touch it, of course, have no effect on it, of course, be completely objective and repeatable, of course, be a non-observer, of course. And I'd do this and look down on this thing and record what happened here. Well, there may be something a bit silly in that position, in thinking you can do that. But science has managed to do it very, very

effectively, and every one of us who got here depended on science doing this, and what it gave us to enable us to get here. So, you know, it's not a thing to be dismissive of, and it's done it, you know, for as long as there has been science, but let's just pretend it's four hundred years.

Now, in 1968 Margaret Mead, who was an anthropologist – if you don't know who Mead was, look her up – but one of the things that she did is she was the first anthropologist to put into practice the notion that the observer of a group of people should not stand aside and be the traditional scientific observer, but should engage with those people in order to find out how they lived and what their values were and so on. In other words, she should consult them and be a part of their life. And she talked to the American Society for Cybernetics (Mead, 1968) and said: "How about you guys are consistent? How about, you've learned certain things you call cybernetics, how about you apply those to yourself? How about, as a society, you study societies, you tell societies how they ought to be shaped, you've got ideals and so on – how about you apply it to yourselves?" We never did. I spent the last six years trying to get us to apply a bit more cybernetics to our society (Glanville, 2004). And it wasn't the first time she said this either. So it fell on deaf ears. But it didn't quite fall on deaf ears. What she was asking was that cybernetics behaved in a way that was somehow consistent with itself. A self-consistency.

Now, let's go back. Here is my thermostatic system. It's got a switch and heat supply and they're communicating in a circularity like that, and I had switched the word control to observe, just for convenience. Here I am observing it from above. Now, isn't there an inconsistency in here? Isn't my observation in here circular? And yet, I am trying to stand above this and pretend I haven't learned about circular systems? So what Mead said was "OK, how about we treat this in the same way as we treat this? How about this observer is in a circular relationship with what it's examining?" So now you have the same form of system. You've got two items in a circle, in here – I've put a box around them and treat them as one – here is another observer and now these two are in the same sort of circle. And that was the origin of what is called second order cybernetics, which is the attempt to bring cybernetics into a form of consistency, but also to recognize that the observer is not optional. That to imagine… Heinz von Foerster, who is credited with having originating second order cybernetics, said, "Objectivity is a subject's delusion that observing can be done without him or herself" (Poerksen, 2004, p.3).

So, let me move on to design. This is all about the magic number two. The word design is extremely difficult because it has very many meanings. One of the meanings that perhaps some of you don't know is the meaning when we say, "He had designs on her," meaning he wanted to get her into bed [laughter]. Perfectly ordinary English. It may not be acceptable but it's perfectly normal. I have to be very careful here. Forgive me, I'm just an Englishman – and I am not even that! The Dutch and Germans didn't really have words for design and they invented them and I love the Dutch *vormgeving*, giving form to things. The Germans use the word *Gestalt*, *Gestaltung* and I love that, too. It's about wholes, it's about making complete, this sort of thing, it's wonderful (Glanville, 2009a, footnote 8)! For the English, the word design came into English in about 1480 according to Eduardo

Côrte-Real (2010) and it came in two forms, both from Italian. One was *designare* and one is *disegnare*. By the way, I discovered I gave what I called an "exaugural lecture" at UCL (Glanville, 2010b). So, I left it for so long to give my professorial inaugural lecture that I was just about to leave. So, exaugural seemed like a better word. And I wanted to talk about the way in which human beings find patterns and I phoned up our professor of Latin and said, "You know *homo sapiens*, all that sort of thing. How would you translate man, the pattern-finder?" She thought a moment and said *homo designans*. Isn't that nice? Pattern finding is designing in Latin (Glanville, 2010a, p. 104)! So, there are these two words *designare* and *disegnare*, one means drawing, one means designating. And they came into English at the same time and got sort of confused. So that's the first two.

The second two is that the word design is a noun and a verb and we get very confused by this. I think for people who do designing, designing is a verb. And for people who assess designing, which is most researchers, design is a noun. And we're not talking about the same thing (Glanville, 1999, p. 81). So I would throw away most design research… ssshh… don't tell anyone! [laughter] I'm supposed to be a professor of it – somehow. I think it's really important we understand this, that we get confused about whether we're talking about a means of doing something, a way of behaving, an activity, or whether we're talking about the outcome of that activity. And for me, you know, a lot of design research is about assessing the outcome of a design activity, and the problem for me is that being told it's not good or not good enough, I know that, I'm a designer, that's what I know. The world I live in is the world of not being right but being good enough, I hope, which of course is very optimistic because it always leaves room for improvement. So, it's not about perfection. But if I'm told it's not perfect what I want to know is, "How do I make it more perfect?" That's the thing that I want as a designer. I don't want to be told it's not quite right. I know that. What I want to know is how to make it better. And that's what most design research doesn't tell me at all. It just disappoints me.

The third pair I want to talk about is the art school and the engineering university. We have in the UK two different traditions that started let's say around about 1850. This is a completely incorrect date, but then I'm a designer, so it's good enough for what I want [laughter]. And there are two quite different approaches and quite different traditions as to how you act in the world and so on. And I think that the art school approach is interested in novelty and accepts the notion of good enough and is concerned with practice, and the university approach gives us a research tradition, and a very good one, and is concerned with efficiency and bestness. These are quite, quite different approaches and we tend to have people battling and saying, "Well, I'm the only one who is right!" I think historically it's the art school lot who are right, which is the lot I happen to sort of sit with. That's where I feel comfortable. But we have these two different ways and they involve very different aspirations and ways of thinking, and I think that we need to keep this at least in mind. I don't think we will ever resolve the difference, and I don't think we have to. What we have to do is, just as the cyberneticians have to be nice about systems, and the systematists have to be nice about cybernetics, so the university engineer designers have to be nice about the art school designers, and the art school designers have to be nice about the university engineering designers. We have to learn each has a strength and each has something to give us.

The last thing I want to say in this sort of sense about design is that for me the earliest definition I know of design, in the Western world at least, remains the best, and it is Vitruvius'. And Vitruvius in his *Ten Books on Architecture* (Vitruvius, 1960), which didn't mean buildings – he meant things like water clocks and viaducts and all sorts of things so it's much more about design than about architecture as we know it as a particular form of designing. Incidentally, the RCA, until I joined the staff of Innovation Design Engineering, when they got their masters students each year they divided them into two categories: designers and non-designers – because we take in a lot of non-designers and knock them into design shape pretty fast – but the non-designers were people from medicine… we had someone who is a quantum gravity physicist, we have all sorts of weird people. And until I got there, architects were within the non-designers! And I looked at the guys and I said, "We were designing eight thousand years before you were – stop being silly!" Oh, anyway! So, Vitruvius gave us three elements: The first is *firmitas*, which means being well constructed, being well-made. The second was *utilitas*: functional, serving its purpose. And the last was *venustas*, which gets translated into English as delight, which I think is a very nice word, much better than beauty or something like that.[2] And I think that we're not designing unless we have delight. I think that it's delight which is the thing which is difficult and which brings the difference between being a human and being a machine. And while I am very interested in machines which bring liberty to us, which I think they can do (Glanville, 1992), I am not at all interested in humans who are being machines – unless they are in some really nice play.

So, for me there is one extraneous thing about design which I consider to be enormously important and it is this, that… You know how it is, we are preserving every bug we can find in the Amazon? And you know that we might tread on something that was the last of that type, and it might at some stage in the future be helpful to us and give us some medicine or something. It is a major concern. I find it strange that we're not interested in different ways of thinking. That we only, or we have a tendency, to want to preserve only one way of thinking. And for me one of the things which is enormously important about design is design gives us a different way of looking at and solving the things we call problems. And for that reason alone it's enormously important. It happens that it works. It happens that it does all sorts of wonderful things, but even if it didn't it would be worth preserving. So, I just slipped that in because I think it's important that we understand that we should be valuing design in this way.

OK, I am going to talk in fact about conversation, and conversation is the bridge between cybernetics and design (Glanville, 2007a). Just think about a conversation a moment. You know a minimal conversation is sort of between two people isn't it? It is difficult to imagine it between one person. Actually, you can, and I'll do that in a moment. But, conversations are between two people and, you

[2] Vitruvius declares: Haec autem ita fieri debent ut habeatur ratio firmitatis utilitatis venustatis. firmitatis erit habita ratio, eum fuerit fundamentorum ad solidum depressio et quaque e materia copiarum sine avaritia diligens electio, utilitatis autem, eum emendata et sine inpeditione usus locorum dispositio et ad regiones sui euiusque generis apta et commoda distributio, venustatis vero eum fuerit operis species grata et elegans membrorumque commensus iustas habeat symmetriarum ratiocinationes. (Vitruvius, 1867, p. 15)

know, just think of going down to the pub one evening and, no to the café, so we're not using much in the way of mind-altering drugs and things of that sort, and we chat with someone and at the end of the evening we're talking about something, we can't even remember anything about how we got there. How did I start here and how did we end up here? Conversation has an extraordinary sort of slippage in it. Now, conversation is a way of being with someone else, of communicating, in which we don't actually have to claim we understand the same thing. It is very difficult, this question of where meaning lies and what understanding is and whether words have meanings and so on. But for me, without sort of dressing up an argument on this, meaning is in my head and your head and what's in your head and what's in my head is completely different. They're absolutely unavailable to each other (Glanville, 2000). And just think about it. If you wish to communicate unequivocally and unambiguously using verbal language, what you do is you join the military and you're bullied for three months to become an automaton, which responds absolutely and immediately and mechanically to certain command words. You just do what you're told (Glanville, 1995). It takes three months to knock the individuality out of us and to turn us into that sort of a machine. I see this as being an indication that language can't work as a code without us doing a lot of work on it. And if it doesn't work as a code, and if meaning isn't in the words but is made by the listener, then how do we communicate?

Well, we have developed this thing called a conversation in which one of us says something and the other one listens and then says something in response. It might be, you know, I might say, "tree", and you might say back to me, "arbor", and I'd say, "Yeah, yeah, that's about the right sort of idea." And we can go on in parallel without actually knowing what the other thinks, but knowing that the other's response to us gives us something that is close enough in our understanding to what we first said, that we can say, "Yeah, they understand." (Glanville, 2007b, pp. 376ff.). And so we have this sort of slippery thing that moves along like this, parallel and sometimes falling apart. Sometimes you say, "Just stop. I can't understand you." We have all the time in a conversation a meta-conversation going on, which is a commentary on the conversation. And we have a sort of substratum, which is the thing the conversation is about. And we can start talking and instead of the substratum being hidden, we can say, "Let's talk about what this conversation is about", and go down, and we go up to talk about how it is we're thinking the conversation is going. So there are three levels. Now, what's interesting about a conversation then is that we assume two different sets of understandings, and we assume that we can participate in this, be one of the people with one of the sets of understandings, and that what we get from someone else is not what we offered, but something which is their version, or what we hope is their version of it, and that's always going to be a little bit different. It's always going to be a little bit different. And that's why you can't have a conversation when you just parrot each other. So if you just imitate someone back – have you ever tried having a conversation like that? Yeah, you sort of do it as a kid, don't you? And kids will do it to you. Who was – there was a lady with a baby, yes, someone back there. But there is also a pram here. You wait! [laughter] So, now a conversation is actually a circular activity. It involves me saying something and you saying something and me saying something and you saying something. Sometimes it involves me saying, "Hold on! Let's go back, do I understand this?" and so on. But essentially it's a circular activity like this, and it has two participants. Tick – tock – tick – tock – tick – tock (Glanville, 2009a, pp. 182 ff.).

Fine, how about if you had a conversation with yourself? How would you do that? OK, it's too many people to ask the audience a question. That's why I didn't ask you to actually do that steering thing. OK, well, how many of you think you are always only the same one person? We have sort of heads nodding and, yeah, and maybe we can get confused here 'cause half of you would be Greek, you'd be doing it the other way around [laughter]. Yes, absolutely. There was a wonderful ad on TV with a guy being, acting furious and being terribly nice to a hairdresser, so anyway, sorry. I just had this image.

We, when we go home we're a different person than when we're at work. We have more than one way of being in all of us. And so we can hold a conversation with ourselves by recognizing that there is more than one persona within us. This isn't a matter of split brain or schizophrenia or anything of that sort. It's just simply how we are in the world. We're not one person. We are many people and we fit together. This, I mean, a lot of people have said this in different ways. My cybernetics professor was one of them. And he was also a person who spent a lot of time formulating how conversation works (Pask, 1976).

OK, I can also do it in this way: I can have a piece of paper and I can make a mark and go away and come back and look at it later. And you know what happens when you draw on something and you come back and look at it later? It looks different than you thought you'd drawn it. So, in a sense, the piece of paper is having a conversation with you, and you're taking two roles: the person who draws, the person who looks, the person who draws, the person who looks. For me, this activity, this thing of holding a conversation with yourself, usually through paper and pencil, is what is at the center of designing. This, for me, is the act that makes design design. This – without this you are not doing design, you are doing problem solving. And the thing which is magical about this is exactly what's magical about the conversation where you end up talking about something you've no idea how you came to be talking about it, you know, at the end of the evening. What's a miracle is that you can make a mark on a piece of paper and see it differently than you meant it. Or sometimes you don't know what you're doing. Your hand is just moving, you know, and you come back and you look, and you say, "Oh, what would happen if…?" And now you're designing (Glanville, 1999, p. 88).

And this is for me at least a major source of novelty in designing, that because there is always this difference between personae, between marking and viewing, between two people. Because there is always this difference there is always this potential not to look at it as an error, but to look at it as an opportunity.

And I think that what designers do is they make errors that are opportunities. They hold conversations with themselves, and it is through this that they manage to do something which is quite, quite magical, which is to find the new. And it is through this that designers "solve problems" – but they don't! What designers do is they go on a sort of wander through the forest and find a

beautiful place to sit down and say, “That’s why I went on this walk today!” (Glanville, 2007, p. 117). It’s that sort of thing that you find something and you say, “That’s it!” It doesn’t mean that you’re not dealing with the functional aspect of things. It doesn’t mean that you’re not dealing with well-madeness. It just means that you leave room for the delight for yourself of making something that you haven’t expected, and for the delight that this can bring others. And this form of activity is entirely cybernetic. And that’s why I say that cybernetics and design are opposite sides of the same coin – at least my cybernetics and my design are. And I hope that for some of you, now, your cybernetics and your design are. Thank you.

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