CYBERNETIC CONVERSATIONS: *DESIGNING OURSELVES TOWARDS DISCOVERY*

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Introduction

In this article I wish to argue for a mode of critical and expansive thinking that our profession can call designerly-knowing, design thinking, or a *design conversation* – if this mode of thought can be understood to be *un*-disciplined, and understood to be critical thought that owes allegiance to no (one external) directive philosophy except the one that regulates the fluid conditions of living and being of everyday existence, as will be explained below. This is not to be taken as a contradiction, since the developing argument will be for an internal (intrinsic) directive that regulates life, but further, also that this intrinsic directive is a shared concept as opposed to an individual one, making this 'directive' a constantly reassembled one. It is in this sense that Merholz (2009) would rather rename 'design thinking' as 'social science thinking', since design needs the clarifying perspectives and viewpoints brought to its practice by the disparate disciplinary backgrounds of the non-designers on the team, while Patnaik (2009) calls these newly combined skill sets 'hybrid thinking'. Roger Martin (in Merholz 2009) acknowledges the need for a different type of 'thinking practice' (inelegant as my phrase may be), since the mere wish for interdisciplinarity, and knowingly putting a design team together from different disciplinary backgrounds will not be enough. I stated above that I do not wish to argue for the type of interdisciplinary thinking that integrates the systems approach into design thinking as if simply adding another string to the bow would solve an inherent problem, since 'the problem' is not so much design thinking but one highlighted by the contemporary, external, world of complex social interactions; the 'problem' is a truly systemic problem, namely one of evolutionary adaptation.

In asking what a systemic problem situation is, we have to ask what is systems thinking? The argument for the integration of the systems approach into design thinking *seems* to flow in the wrong direction, from an 'external' theory to the domain of design thinking, a statement that contradicts the fact that I believe in design's ability to reach out to other disciplines and ways of thinking, and to draw to itself[1] what is needed for the context in which 'design thinking' has to operate. Under the rules of traditional logic, then, we should not be able to do this, since, according to disciplinary tradition, you are not supposed to solve an economic problem with theories sourced from philosophy, and neither do you solve design problems using theories sourced from business studies, engineering control systems and human computer interaction (HCI) activities.[2] However, systems thinking, as it evolved from General Systems Theory, is used extensively in Business Studies (cf. Peter Checkland and the Lancaster University Management School) and elsewhere (meaning, really, not in design), and the study of cybernetics (regarded

by many to be synonymous with systems thinking) is used constructively in those disciplines that need to study the many ways that inputs, communication variables and outputs can be pre-determined, that is, those disciplines that rely on the mechanisms of determinism to control the systems under its management. However, on a very fundamental level there are two different version of systems thinking, the first-order (*systematic* thinking) which functions through negative feedback for deterministic control, and the second-order (*systemic* thinking) that functions through positive feedback for adaptation and change, and it is this version of systems thinking that is applicable to design as a process, applicable to design as a social act of reciprocal communication.

We may thus regard both systems thinking and cybernetics as the same (albeit *hybrid*) approach to the mindful thinking processes needed to change design itself, since the aspects common to both that deal with the observation of circular processes are what is essential to design. Design's version of systems thinking and cybernetics is concerned with the observer and the observation process, with which terminology we may make another distinction between first-order and second-order systems/cybernetics, which is that the first-order studies an observed system (as in what used to be called 'objective' science), while the second-order studies an observing system, including the study of the observer of that system. A systems/cybernetics way of approaching the whole of the design process means we acknowledge that 'the system' we are a part of 'looks back' at us, interacts with us, as in a real *cybernetic design conversation*. *Systemic* thinking, which implies the inclusion of the person or the group that commissions the design in the first place, used to be a taken-for-granted and *integral* part of the 'design' process when design was still looked upon as a craft, or, for the purposes of this argument, seen as a direct and consequential *conversation* between maker[3] and client. For that reason, my argument for design's renewal can only follow Heidegger (in Dreyfus 1991:270) in equating *truth* with *unforgetting*, bringing that which was 'hidden' (or forgotten) to the fore in a phenomenal encounter of discovery through the medium of a *thoughtful* and *cybernetic design conversation*, the main focus of my argument. We need a new outlook, a new way of seeing the world; to encourage designers and 'non-designers' alike to become both critical *and* liberal thinkers we need to change a semantic question into an autopoietic structural one (below), and we need to find the communicative (and transformative) possibilities we lack in the simple act of *conversation*.

In biology, Humberto Maturana and Francisco Varela (1980:2) studied pigeons in order to find out how they could cope with the world of form and colour, that is, they wanted to know what form and colour looked like to a pigeon. They got no answers, because they were looking at the end-result, looking for the solution, and by their own admission, *not thinking* systemically because the semantic question *how do form and colour present themselves to the pigeon* put themselves, as system observers, in the wrong position. They therefore changed their observational position and asked, instead, a structural question, namely *how is it possible for pigeons to deal with the world of form and colour*? They were, in fact, asking a question that foregrounds 'systemic thinking': *what structure does any organism need to operate adequately in the medium in which it exists*? The question is not what can feedback from the world offer a pigeon, a living entity, but rather what does this entity do with the feedback that does exist (and ideally, what does this entity do to let feedback emerge), how does it choose among the feedback loops, and how are these choices justified? In other words, how do humans know how to cope with the world and each other, how do they

acquire the knowing structure that enables them to do so? The focus of the next section tries to answer that question by offering the notion of a cybernetic design conversation based on human intrinsic control.

Conversation and control in the animal

The problem that any design teacher should address, but one that many in practical design simply do not acknowledge, is that of language use. Not a simplistic use, but one that acknowledges that, 'whatever else we are doing, we are all doing language' (O'Rourke 2003), and in design education an interactive conversation between multiple participants[4] is not only essential, but has eclectic ontological implications. Design as a social activity needs the dynamics of collective and negotiated compromise that a cybernetic conversation can bring to the situation. However, one of the biggest problems still to be overcome is the (human) susceptibility to the power of negative (restrictive) control. This section offers the notion of intrinsic control as a (cyber/design) solution, not to the intricacies of design and its objects as such, but to a designing of the knowing self.

Design as an *in-between activity*, as Herbert Simon[5] seems to be suggesting, can be seen as the social act of mutual recognition we should be striving for, and that position can only be brought into being within 'a conversation', a negotiated interaction with the other that nobody can (or should) avoid. We may deny the results, or refuse the negotiating aspect, but we cannot avoid the interaction with the so-called 'outside world' of other people and objects. We are all 'doing language', and designers should learn how to use this tool-for-understanding, if only because our interactions with the outside-of-the-self is an inevitable ontological activity that builds our very identities as thinking beings.

Simon's (1992:129) statement 'everyone designs who devises courses of action aimed at changing existing situations into preferred ones' may as well read, *everyone who languages new and innovative situations into being is a designer*, seeing that he believes design to be 'the core of all professional training', and we can ask, *how do you language the new by having a conversation about preferred situations*? Following Blevis's (2006) analysis of Simon we should focus on what a preferred situation means, not forgetting to language the meanings inherent in *courses of action* and, likewise, in the notion of *situation*. We are capable of planning into the future, to envisage new scenarios in contrast to existing ones, and to devise possible courses of action to achieve the decided-on preferred situation. We can do this because we can *language*, used as a verb in the same sense that the word design can be used as both a noun and a verb, and when we are 'doing language' by having a *conversation*, we should be aware of its active and constructive nature.

The obvious garden fence conversation

Niklas Luhmann (2002:156), in the process of integrating Maturana and Valera's biological theory of autopoiesis into his account of social systems thinking, was of the opinion that only communication can communicate, and we can adopt this way of seeing by stating only conversations can speak or converse with each other, by means of their cybernetic qualities.[6] It is, to me at any rate, of interest that *converse* stems from the Latin for 'to keep company with', and further, that this implies 'with' and 'to turn', and a cybernetic conversation has these qualities, or are these user requirements?

A real conversation must keep the 'correct' company for the sake of progress, and its interactive nature means that all participants change in a developmental movement from existing situations to preferred ones, vistas for renewal and learning that a good conversation can begin to reveal as *Bildung*. Only conversations speak to each other, and by this dynamic interaction they manufacture contexts, and the real-time cyclic nature of these interactions can, at any one moment, be called the content of that conversation, or learning process. The reader will no doubt have picked up the seeming flaw in my argument, which is: what exactly are you terming a conversation? There seems to be two 'events' that are both masquerading as 'conversations' – if two people in communication with each other constitute one conversation, then how can two conversations have a conversation?

Only communication can communicate, and likewise only a conversation can 'speak' to another conversation. Cybernetically, meaning that when we see the observer as an autopoietic unity, we should acknowledge that operational closure means, in effect, that people do not talk to each other as much as they are talking to (having a conversation, or interacting with) themselves and their environment, and the person you are 'talking' to, interacting with, is just an element in that environment. You are not talking to a person as much as 'talking to' their language use, their conversation being sent out, or communicated, to you. What we have here are two 'speech bubble conversations' trying to make sense of one another, as much as two autopoietic systems trying to 'feed' themselves[7] in the process of self-generation.

Figure 1A shows two people (cf. Endnote 3: a 'conversation' happens between any two or more elements) having a conversation, but since each person is an autopoietic system bent on self-generation, they cannot actually 'detect' each other directly, except through their outputs. Only the communications that make up the conversational field can 'detect and connect' within that field of interconnectedness, that *in-between* that is the meta-environment 'outside' each system. We must also remember that the communication from system (1) is, to system (2), simply part of the background possibility, part of the medium that makes up (2)'s outside environment, and therefore nothing special compared to the communication from (2); that constitutes the first and biggest hurdle in the communication process.

However, since there is no such thing as a direct transfer of information, but only mediation, in Figure 1B we can see some of the paths that information emanating from both (1) and (2) follow, and the real-time process is beginning to look more complex than would appear to be the case when we are simply chatting over the garden fence. In order for (2) to make any sense of the conversation, the system must distinguish[8] between its own production and that of the other system (1), which has to compete with all the other streams of communications in the meta-environment. The conversational event, an interactive space filled with various inputs, shows its face differently to each system taking part in the conversational event. This '*interface*' constitutes the situation-understanding-interpretation field for each system, and the only 'content' that can speak to system (2). Figure 1C tries to unravel some of what is being produced and received, with some of the received information stemming from (2)'s own production.

We not only transmit information to a receiver, the conversational partner (to fall back into old terminology), but we also receive information from that other-to-the self: we are *told* that, but the system does not 'know' this, or cares, only seeing the field it can make use of, and all the signals it allows are also

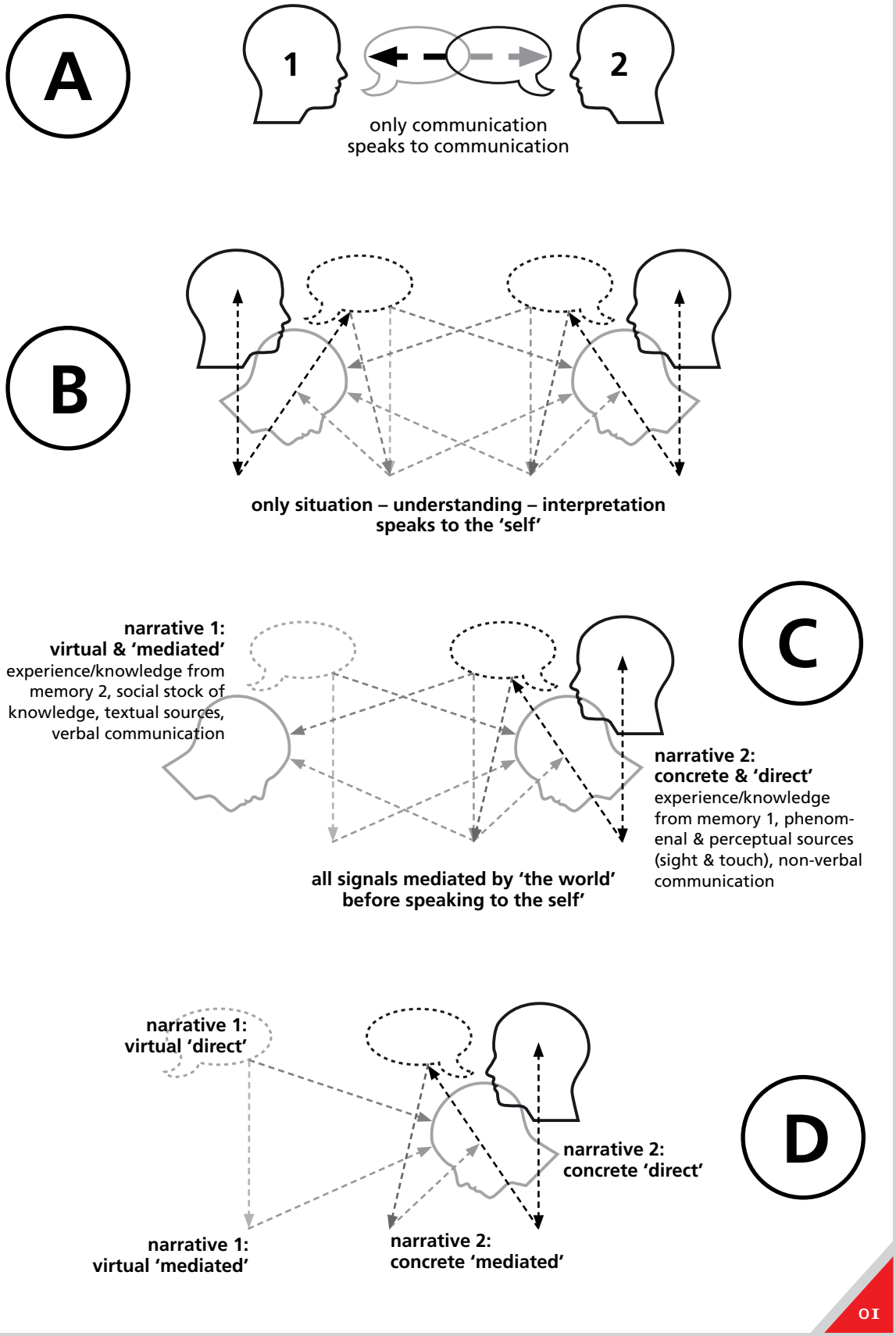

Figure 1: Conversational echolocation.

ones mediated by this field or 'world'. Then again, we also receive information from ourselves, in the act of transmission, and those are also mediated by the outside field/world. Concrete or direct narratives (2) are signals the self receives from the phenomenal world where its experience lies, but of course also from memory, where this experience is lodged or stored; to complicate matters what seems to be the same signals are received from the field we interact with, but these were not produced by 'us', and are therefore virtual and mediated.

As Figure 1D shows, virtual and mediated (1) signals are stimuli for our direct and memory experiences, produced by (1), and either sent in speech (virtual direct) or we receive these signals because we observe the effects of these signals bouncing off 'the world' as it were, hence virtual mediated. There are also signals, if one may call them that, created by listening to your own transmissions, which are the equivalent of (1)'s virtual mediated signals. All this means that an autopoietic system is 'a system of communication ... that produces and reproduces through the system everything that functions for the system as a unit' (Luhmann 2002:161), that two people in conversation do not 'see' each other, but each system 'needs' the other, or, rather, each system needs stimulation because, despite being operationally closed, it is at the same time informationally open.

What if there are no real inputs and outputs[9] in any working system, but only fields of force? If I do not know that 'you' are there, outside, since that awareness is not the point to a self-generating system, then why would I, this autopoietic system, produce any 'outputs' (which is, really, for someone else's benefit)? That I produce something is certain, but what else is this 'something' – that is necessary to the system to operate as an auto and closed system – if what I produce is used by my system to maintain itself? Can my production have side effects, as it were, or, in the absence of 'outputs', can my production, as the very essence or reason for my system's existence, be construed as a 'force field' that contains all that 'I' am? On reading Bourdieu's description of habitus as 'a *structuring mechanism* that operates from within agents' (Bourdieu & Wacquant 1992:18), i.e., the disposition of mind that contains our beliefs and habits (of thought *and* action), I can happily see habitus as an autopoietic force field, innate to each system. An informational gossip over the garden fence involves two unlike force fields attracted to each other, and the obvious answer to who controls this neighbourly interaction is 'The controller is controlled, itself, by that which the controller controls' (Glanville 1995), another way of saying that we design the world as the world designs us (explained below via the concept of *intrinsic control*). But if this circular control occurs *in-between* (Glanville, 1997), then what do we mean by 'control'?

Not a matter of control ...

Having seen off inputs and outputs that justify an artificial non-involvement by the observer (although it is tempting to use these descriptors for the sake of convenience), perhaps we can chance another radical constructivist statement: there is, conversationally speaking, no such thing as second-order cybernetics. Cybernetics is a theory that sprung to life by default; the scientists that gathered in the 1940s to discuss matters associated with the Second World War found that they could not hold a simple conversation owing to their specialised fields of interests, so they asked the one question that no one knew the answer to: *what is the nature of control*? Consequently, according to Stafford Beer (2004:855-857), the very naming of the theory and the nature of true control has the same source,[10] although popular use distorts both. Cybernetic

control is not meant for trivial machines,[11] and the human body-and-mind system is not a trivial machine, but then neither is a modern fighter aircraft, yet both exhibit cybernetic forms of control. However difficult this is to express and illustrate, there is, in a very important respect, only one form of cybernetics, as there should only be one form of cybernetic control. All trivial forms of control, those that pull 'levers to produce intended and inexorable results' (Beer 2004:857), only mimic the surface nature of cybernetic control, while all non-trivial machines, including ourselves, need the edge-of-chaos[12] disposition of the only form of control that nature allows. While it may seem strange to speak of nature while also mentioning (real) machines, cybernetics is not about the detail, the metal or the flesh, but about the organisation of all the elements that make up the system, and a successful (future) fighter plane needs to be an autopoietic system, with *intrinsic control*,[13] similar to a successful human biological system. Seen on this basic level, and from this single viewpoint of true cybernetic control, there is only one meta-form of cybernetics,[14] with contextual variations.

If we look beyond the (human) question of the absence or inclusion of the observer to the essence of cybernetics, as *theory*, the machined system and the biological system should both exhibit an integral and intrinsic control, with the machine acting as if it were its own observer, since that is what we expect from an autopoietic system. Beer (2004:857-858) almost jabs his finger at the significance of Wiener's descriptive definition of cybernetics: *control and communication* ... and if we are to be logical, you cannot have both if levers are to be pulled. *Leveraged* 'communication' is mere information without interpretation; communication cannot be controlled except by fascists, and it is as if Beer is highlighting the *conversational interaction* between the two terms[15] ... *in the animal and the machine* ... reflection on these strange associates seems to call for a refocus of what the two terms have to say to each other, otherwise why use them in the same sentence? What they have in common is intrinsic control, control that communicates because the optimal function of the system is on the edge of chaos, that *in-between* space of possibility that balances disequilibrium and equilibrium.[16] This type of control is a *transaction*, which makes it simply another interactive conversation between the system and itself (on the understanding that this system is both operationally closed and structurally/informationally open).

... but of conservation

In my experience intrinsic control is normatively important in the context of constructivist teaching, where this notion of control becomes an integral part of the learning environment, an evolving and self-regulating educational conversation-in-the-classroom that uses Stafford Beer's (1979:57-73) 'muddy box[17] regulatory system' as a deceptively simple base model with inputs, outputs, and feedback loops. It is what happens *inside* that matters.

In this interactive situation where two or more systems are communicating, Beer's muddy box becomes a learning device as much as a regulatory system, that is, it cybernetically controls. *Who controls what?* The key word is interaction, and therefore the magic ingredient becomes the *control of variety*, by all participants to the conversation. Now imagine that we can do without the notion of inputs and outputs,[18] that feedback loops are still there, but we have to rethink how they function. If we can imagine all participants (human, mechanical, all actors and actants in the system) being represented by their force fields (i.e., their habitus and practice combined, this autopoietic *structuring mechanism*), we can get a clearer picture of how

two or more autopoietic systems trying to communicate might function in this interactive environment. Inside the box, inputs are merely the 'accidental' outputs or effects of a single system as it goes about its lawful business. What we normally term inputs and outputs are artificial constructs that can only be named and positioned afterwards, not before the conversation starts. So dispense with them, in the conversational moment; there are only systems in conversation, there are only cybernetics and control.

Dealing with variety is dealing with life, and life demands the conservationist power of control. Ashby's Law of Requisite Variety (Beer 1979:84-86) states that only variety absorbs variety, not in the sense of numbering states but in *developing matching states*. In this sense feedback loops are also, essentially, a biological necessity: the system allows information from outside to enter the system, and as a result it changes. These changes are detected by another system, and the process of feedforward/feedback is continued, if not perpetuated. This highlights the presence of both *conversations and interactions of actors*, and Gordon Pask (1992) differentiate between the beginnings and endings of the conversation, and unlimited interactions that 'do not generally have a start and finish'. Design as product is a conversation with a beginning and an end, while design as process is an interaction of actors, with no discernible start and finish.

Then design as process cannot be (or contain) a cybernetic conversation?

No, that was not the intention. Multiple conversations take place *within* a network of interactions of actors.

To return to Ashby's influence on conversations as learning mechanisms, in the classroom interactive space variety has to be operationally reduced, since the system (single or multiple) naturally produces variety, but to what end? Left unchecked, the (larger) system will dissipate, so the autopoietic system's operational organisation needs to close, in order to operate. But the system's boundary is open to information, and so the classroom conversation induces variety (adjusting the viability of Beer's muddy box to progress from structured solvable problems to dealing with ill-structured wicked problems). This is necessary because, like the cybernetically controlled fighter aircraft, students need to match the variety of (new) information with their own variety (possibility) of response. It is for this reason that I cannot agree with Glanville (2007:1195) that Ashby's Law is not applicable in the world of design, where we are not in control, especially not of the design conversation. Agreed, designers defer to the social context of the design situation, but a design-style adaptation makes full use of the cybernetic principle of control: 'every regulator must contain a model of that which is regulated'[19] (Beer, 1979:234), and the regulatory process of intrinsic control 'sees to it that Ashby's Law is automatically obeyed; therefore there is no loss possible in balancing the variety equations' (Bee, 1979:91). I do, however, agree with Glanville's viewpoint (2007:1189) that we (design teachers) should not even try to (negatively) control the situation, because a constructivist classroom run on cybernetic conversational principles 'can easily set up situations in which the variety to be controlled is vastly greater than any variety you might ever have access to'. But we do not have to, and Ashby's Law still works in the classroom and in the design context.

Intrinsic control is situated *within all participants*, and as a principle, it opens up the in-between space of innovation called learning, because when one observer (playing a part in the conversation) manages to *make happen* the model-of-knowing of that which is regulated, and all the other observers follow suit,[20] all the systems' intrinsic control structures flow one into the

other, and negative (non-participatory) 'control' is not even an issue: first-order cybernetics learns from second-order cybernetics, and both (all) conversational partners become simply kubernetes-systems-in-symbiosis, networked into knowing. Personal and professional identities emerge during these recursive interactions with the medium that contains the system(s) at the time. System design (read cybernetics) becomes a user-customisation of complex working environments in real time, which means that cybernetics, as meta-design, deals with the quasi-real world that allows an object-thought dance to play out in the fourth dimension, while investigating the not-yet-real existence of pure, ontological possibility. Still, given that design is a social activity, we have to ask, what does all this have to do with society at large? How can mere conversations help social systems design?

What is a cybernetic design conversation for, *really*?

In his review of *The idea of justice*, by Amartya Sen (awarded the Nobel Prize for economics in 1998), Tasioulas (2010:9) focuses on one particularly interesting aspect, namely the way Sen opposes the principle of *the ideal theory of justice* (in its transcendental institutionalist form derived mainly from John Rawls) by suggesting an approach that reads very much like a social systems design conversation.[21] Rawls wants to set up a social contract along the lines of Hobbes, Locke and Kant, which would institutionalise a set of rules embodying the ideal theory of justice, while Sen wants to compare the very need for justice to situations in the real world. Sen's (in Tasioulas 2010:9) idea of justice, the theory of what it should be and what it could accomplish, is based on 'what emerges in the society, including the kind of lives that people can actually lead'. Sen's comparative/social realisation (CSR) approach wants to achieve an open form of dialogue based on reasonableness – the opposite of partiality (almost instinctively protecting individual/social group interests) and parochialism (not being able to see beyond the bounds or parameters of the group), that is, 'democratic modes of public deliberation, dialogue and interaction' (Tasioulas 2010:10) very much in line with the Habermasian[22] view of working within the real world (and its Rittelish scenarios of wicked problems) to achieve any form of justice. Basing this on *reasonableness* in the public sphere means this open form of dialogue-driven justice is an ongoing social systems design that needs to be protected, not the particular form of justice, or the design, or the system, but the very fact of the conversation itself, as if it were a living thing, which in part it is.

If we wish to take the idea of a cybernetically designed conversation seriously, and offer a reasonable approach to the process of setting up such a conversation, the very foundation on which this process rests must be derived from the logic of, not *ideal* theories of social conduct, but a living logic to be found

> not in the pseudo-logic of clear ideas, not in the logic of knowledge and demonstration, but in the working logic of every day [social reality], eternally mysterious and disturbing [in its complexity], the logic of the structure of the living thing (Maritain 1939:52).

Nelson (2004:262-263, 265), speaking in connection with a cybernetic design conversation and the nature of inquiry itself, states that the logic used by description and explanation ('what *can* become real') is quite different to the logic and *reason* of 'what *should* become real' in the sense of seeing this scenario as a design question based on interested groups (cf. the public sphere, above) that form intentional social systems. Given that we may accept, for the sake of argument, that a social systems design conversation must (at least,

among other principles) be based on the principle of *reasonableness*, or even just the logic and reason of what *should* become real, while at the same time placing this conversational process in the public sphere, so to speak, we may also ask whether allowing so many disparate voices to participate in the developing design would allow the process itself any chance of success. On a politically nationalist basis (cf. the current European situation) the underlying partiality and parochialism is self-evident and seemingly inevitable, and it seems that for the sake of political expediency the answer is, by and large, in the negative, since consensus must be reached as to 'the way forward', and too wide a public participation curtailed for the sake of governance. What, then, of Sen's *idea* of justice, based as it should be on the lives of real people (everyone in the group concerned, irrespective of their worldviews) as opposed to the *ideal* of justice based on what Maritain would call the pseudo-logic of set rules, linear, clear, unvarying, fostering 'the ever degrading and hostile political discourse' (Banathy 2008:25) that is anything *but* reasonable. Any activity that effects the working structure of the public sphere carries within itself, in fact can be interpreted as, a discourse of some kind, becomes a social system design conversation, and should therefore strive for an approach that Banathy (2008:25) states represents a 'yearning for civility, mutual respect, and dignity in our social discourse'; in short, the idea of justice.

'Evidently, he [Sen] does not intend justice to equate with what Aristotle called "universal justice", namely interpersonal morality as a whole' (Tasioulas 2010:10); indeed not, since Sen argues for the *idea* as opposed to the *ideal*, for the living concept as opposed to the book of rules that allows no evolutionary and systemic adaptation. Aristotle was a very practical philosopher, one who practiced the logic of *the structure of the living thing* (above), the idea of anything as an evolving 'thing' emerging from the needs of the people concerned, and to him universal or general justice (the ideal) was not to be confused with particular or (shall we say) practical justice (the idea). A working and democratic viewpoint is not to be found in the ideal of universal justice, but in Aristotle's practical or ethical justice, since, as with the ethics that should underpin the idea of sustainability in design thinking and practice, the concept of ethics cannot be written down, or defined as a set of rules, because it will not let itself be articulated, directly, but must be allowed to show itself, and, like Nelson's (2004:265) description of what happens 'when words are not enough – when dialogue falls quiet', we have to allow a 'thing' (cf. 'an evolving thing' above) to show itself, to become clear through its image in another's representation. Ethics, in von Foerster's (1991) translation of Wittgenstein's words, will not let itself be expressed. Just as Heidegger's Being will not let itself be expressed directly (although Dasein – everyday existence – can be only too clearly expressed), so what we are pleased to call ethics cannot really be brought to light in direct everyday expression, except through human actions, and therefore through the consequences of the choices each individual makes; ethics are only expressible when 'dialogue falls quite' and we see the image of ethics in the representation of each other's actions and its consequences, and we see where all of us are heading in the developing social systems design conversation, itself a 'thing' that cannot be expressed or perceived directly, but must be allowed, in a *reasonable* way and in the public sphere, to develop as a living systems idea, and therefore protected as an ongoing and necessary conversation.

Making waves

This is Aristotle's practical justice, the very idea of an ethical life lived as if 'no set of rules, no matter how

long and detailed, obviates the need for deliberative and ethical virtue' because the intellectual virtue (which I believe both Maritain and Bourdieu would term *habits of thought*) needed for decision making depends on 'a detailed understanding of the particulars of each situation' (Kraut 2010). What we have to remember is that, as guidelines for constructing a civil society go, this approach is as close to *perfect* as we can get: in making decisions based on an idea of the real we design our own habits of thought, a mindset that acts as 'a disposition [that] operates with only one set of conditions and not their opposites as well', a social systems design conversation that 'is perfect in a special way, because the man who possesses justice is capable of practicing it towards a secondary party and not merely in his own case' (Aristotle 1971:139-141). Acting in this dispositional way towards the self as you would towards the other is constitutive of both systems thinking and the very idea of a cybernetic design conversation, the latter compared by Winograd and Flores (1988:159) to 'a dance, giving some initiative to each partner in a specific sequence', while the former is characterised by von Foerster as an invitation to a dance, and in equating an invitation to dialogue with an invitation to dance he is speaking about a type of willing or consensual togetherness: 'when we are talking with each other, we ... invent what we both wish the other would invent with me' (Waters 1999).

This dance of consensual togetherness is termed *patterns of interference* by Nelson (2004:263-264); having explained the types of *designs of inquiry* that include truth-seeking inquiring systems and ideal-seeking ones, he reminds the reader that both forms of inquiry, although different, are pervasive in our history and lead to what can become real instead of what should become real, that illusive something that Heidegger (in Dreyfus 1991:270) called the *truth-in-hiddenness*, the 'truth' of the logic of the living thing that cannot be written down as a set of rules, but that has to be found in a cybernetic design conversation, in the design dialogue, that is a *desire-based inquiry syste*m (Nelson 2004:263-264). Corresponding to Aristotle's and Habermas's approach regarding social participation, a desire-based approach, as an inquiry system that creates patterns of interference, shifts the focus of what *should* be, what is *desired*, from the participants themselves to the newly developing context, something that can only happen if the participants in the cybernetic design conversation are willing to act in this dispositional way (towards the self as towards the other). What *should* be decided is what the new context 'desires', an amalgam of what the individuals in the design conversation desire, and yet much more, since Gestalt theory (long recognised in graphic design) tells us that the (new) whole is more than simply the sum of the parts. The new 'desire' – what should be decided in social justice – can only come into being through these *patterns of interference*, amounting to the *dispositions-towards* of each participant that act like the (overlapping) ripples created by several pebbles dropped in a pool of water, and in design terms can be called the hybrid effect of different *wavefunctions interacting*.

Although a wavefunction is a mathematical object, it can also represent all-that-there-is-to-know, that is, all the information content of any one entity (person, group, organisation). In opposition to Mitleton-Kelly's (2005) belief that '[c]omplexity, however, does not argue for ever-increasing interconnectivity', I argue for an increase. Mitleton-Kelly emphasises the dependency resulting from this connectivity, and 'that the greater the interdependence between related systems or entities the wider the 'ripples' of perturbation or disturbance of a move or action by any one entity on all the other related entities'. This is a new (group) wavefunction that is being formed, and in contrast to what Mitleton-Kelly believes are non-beneficial

effects on everyone concerned, it does allows the new to emerge, and allows each participant to extract from this phase transition (a transition between chaos and order) whatever is autopoietically necessary for each system to not only survive but to evolve and prosper. Each survives because the other survives and prospers. An autopoietic 'dependency' is not a negative thing, being the very fabric making up the conditions for emergence and possibility (van der Merwe 2007:97). In that sense *human knowing* is two or more wave-functions that collide to form patterns of interference (information restructuring) that in turn form a new entity via the effects of a dispositional and cybernetic design conversation.

Let the conversation decide, finally

Design as a process is an in-between activity, just as the cybernetic design conversation, according to the argument above, relies on the 'quantum physics'[23] equivalent of a dispositional phase transition, in real time, that emerges from the human interactive inputs: the new emerges from a hybrid mix of the old, so to speak. To further illustrate this point, I believe that Aristotle, in his argument for justice, makes the point not just for incompleteness, but for the *in-betweenness* of things. When we take any topic seriously we have to ask 'what degree of accuracy is to be expected in any of them, in order that we may not unnecessarily complicate the facts by introducing side issues' (Aristotle 1971:40). In a true systems fashion Maturana (in Winograd & Flores 1988:48) reminds us that the organism and its environment must not be seen as two separate things but are, in fact, defined by what is a new unity that 'specifies the space in which it exists, and in observing it we must use distinctions within that space'. The participant and the cybernetic design conversation form such a new unity (made more complex through attracting multiple participants), and no Aristotelian 'degree of accuracy' can be expected that does not emerge *from within* the conversation, a process that correlates to the autopoiesis of any living cell system that allows no changes to take place except as an internal restructuring (neatly capturing the inner workings of the learning process itself). Seeing that we can only expect 'enlightenment' from within, and only make decisions based on 'internal distinctions' it becomes clear why a cybernetic design conversational environment has to be *in-between* and 'factually' (objectively) incomplete, with the only constant being the flow of information.

In this regard, Boland and Collopy (2004:4) make out a case similar to Aristotle's, in that they argue against the prevailing management practice and education that relies too heavily on a 'decision attitude' that 'portrays the manager as facing a set of alternative courses of action from which a choice must be made', as if from a manual of *ideal* forms that emphasises the difficulty of the choice, but underplays the making of distinctions, or the design of alternatives. On the other hand, '[t]he design attitude toward problem solving ... assumes that it is difficult to design a good alternative ... [and] is concerned with finding the best answer possible, given the skills, time, and resources of the team' (Boland & Collopy 2004:6). The *idea* of creating new alternatives is more important than the ideal of choosing among given 'alternatives'. As Conway (1968) also found, '[a]ny organization that designs a system [defined more broadly here than just information systems] will inevitably produce a design whose structure is a copy of the organization's communication structure', or, any group that makes decisions based on ideal or pre-set and *complete* conditions, and that do not allow internal cognitive changes to take place (making decisions based on

the power of emergence) can only produce a design solution that mirror's the group's disposition towards controlled determinism. This is first-order systems in action, and for many designers, still, much the safest way.

It is not, however, design in the modern sense, and is not conducive towards a cybernetic design conversation. Any intellectual activity, especially if self-referential, can be regarded as design, and allowing the medium in which distinctions can be made (i.e., between old and new positions) to be called design can make of a conversation as much a designed object as any concrete production line artefact (Conway 1968; Lyytinen 2004:221; Schiltz 2009:173), but with this difference: a social systems design conversation will facilitate the design of systems whose structure is a copy of the participants' communication structure (above), in the sense of 'expanding the domain's horizons beyond their own capability of observing that expansion' (Schiltz 2009: 173), and 'the conversation' can do so, can become the deciding factor, because it fulfils the role of the structure of the living thing.

From first to last

This argument has been about the rediscovery of systemic thinking in the design process, and particularly about the capacity of the cybernetic design conversation, as a living systems design in its own right, to offer its participants a new way of seeing the world around us, and how we interact with it. The argument for a social systems design conversation, cybernetically-driven, includes the important aspect of gaining intrinsic control over the self, before 'the other' can be dealt with in any *reasonable* manner, since, while gaining control over events in the real world have merit (as first-order systems and product management), to transfer this same mindset to social systems leads to an unjust and uncivil society. I wish to conclude this argument with an addition to the decision/design attitude debate (above), a dispositional way of thinking that slots in with the difference between working *from the ideal* and working *towards the idea* (cf. Sen's argument, above).

Aristotle (1971:29) posed this question: in arguing your case, is it better to argue *from* or *to* first principles? Two things Aristotle (1971:39, 41) wrote are important to interpret his views on this issue; (1) 'when the sketch is well done, anyone can finish the picture' strengthens his viewpoint on the essential incompleteness (in-betweenness) of our acts of being, and (2) '[w]e shall find that this applies to 'beginnings', which is our name for first principles; in them the fact is the beginning'. What does this establish? That we will do well to accept the premise of incompleteness for the *essence* of anything, including our own developing beings as acts of creation, and that this approach to seeing and understanding the world begins to encompass also the idea of beginnings: all acts are incomplete, beginnings are incomplete, and as such all first principles also, leading to the incompleteness of all things to be called *facts*. Now Aristotle says something that appears quite radical and at odds with my own teaching, which is that students should always ask the why question of everything. Aristotle (1971:30) states that 'we begin with the *fact*, and if there is sufficient reason for accepting it as such, there will be no need to ascertain also the *why* of the fact'. But, read in the light of his view on incompleteness, and like the writings of Heidegger that at first appears to contradict our cherished views, under investigation, using the mechanism of a cybernetic design conversation that asks all pre-judged beliefs and views to be suspended 'for the duration', Aristotle's text begins to 'unhide' (Heidegger's *reveal from a space of hiddenness*) their meaning.

Aristotle's *fact* is incomplete, the idea instead of the ideal. As such it corresponds to our own beginnings, as first principles: Aristotle's *fact* is a mutable *instance of being*, neither textually nor historically captured, in the sense that it is human experience and consciousness that is taken as the *beginnings of everything that comes after*, that is, experience built on an action that can only be described as the *present-compelling-itself-into-the-future*. This is the very idea of what an experience is, can be, and can afford us, as human actors, in our knowing interaction with designed objects, situations, and with groups of people, which contact leads to an *intelligible relationship*,[24] a space of understanding of our new selves as knowing beings, and because of this, a knowledge of our (new) relationship with the world and everything in it: our total world space. This is an Aristotelian *the-fact-of-being-human beginning* that does not begin at any defined, historical point since it always already begins at all points, and therefore, like true design (as an idea), never ends.

Aristotle's *first principles*, then, as incomplete *beginnings*, is a stance towards an ontological understanding of the self and its place in the world that asks a different question: the *why* turns into *what next*, an in-between, unspecified, 'incomplete' question that makes use of whatever is there, at, and in, the moment, in and with the dynamics of the cybernetic design conversation. New beginnings that have to be looked for, which is why one *argues to* these first principles and not *from* someone else's: first principles in Aristotelian philosophy and in design proper are rigorously (ontologically) individual *and* social. I submit that this systemic approach to design, to life in general, is the way to justice for civil society, for we invite each other to experience, to invent and so discover what we both wish the other would ... this approach is an open invitation to dialogue that has no beginning and does not end.

NOTES

1 Design's ability to reach out to other disciplines has its origins in the statement by Wolfgang Jonas (2004) that design is a groundless field of knowledge, comparing those areas of disciplinary knowledge that are needed for any one context to islands in a sea of possibility. Our problem in the design process is that we have to connect carefully the chosen islands of knowledge in a specific way, each time we make use of the knowledge of others.

2 Traditionally, disciplines have developed and used only their own theories applicable to their specific concerns, and very little, if any, overlap occurred between disciplinary fields. The term *design* has, however, been used by many disciplines as if they understood design as a discipline, which they quite obviously do not, since the term is used almost exclusively to be synonymous with *controlled planning*. This situation has been changing quite fast in the last decade or so, through non-design disciplines reaching out to design knowledge, instead of merely appropriating the term.

3 Dunin-Woyseth and Nielsen (2001:27-28) suggest an epistemological premise for design: they have adopted the term *making knowledge* to highlight the essence of design as a *making* profession.

4 The argument in this paper is that a conversation, although possible between just two participants, usually includes (consciously and unconsciously) multiple participants, and for a design student this can mean an exchange of information between the self *and any other*(s): human and human, human and book, human and natural/designed object. This conversational exchange can take on multiple forms as well, verbal, non-verbal, sensible- or auto-suggestive, direct, mediated (cf. Figure 1).

5 Simon (1992:130-132) regards design as a discipline of the artificial (whether engineering, architectural,

business, education, law, or medicine 'design'), and shows 'that a science of artificial phenomena is always in imminent danger of dissolving and vanishing' when we focus on the designed artifact's interface. This viewpoint makes of design what Simon calls a *boundary science*, a science of the artificial that operates *in-between* other sciences/disciplines.

6 Conversations are not about concepts, however much they may be the focus of each conversation, but about each participant in the interaction (Pask 1996:357). Conversations speak to each other because they are proxy humans.

7 Part of this process, and one of the most important aspects of conversation theory, is this aspect of teach it back, whether by a person, and object, or a whole context.

8 What differentiates between an informational garden fence gossip and a privet-crossing 'bore-the-neighbours-to-death' monologue is Pask's *Last Theorem*, which states that like concepts repel, and unlike concepts attract (Green 2004:1438). The concepts that 'nestle recursively' within the conversation (within the interactions of actors) are either garden fence positive (unlike/attract) or boringly negative (like / repel).

9 I only have a vague suspicion that Gordon Pask wrote something of the sort: 'there are no inputs or outputs, but only fields of force.' If he did not, it still sounds like him, because he did suggest an alternative to the input/output type of observation (cf. Footnote 17), and his Last Theorem is about the nature of weak and strong, positive and negative forces.

10 *Kubernetes*, or steersman, is exactly what 'control' should refer to.

11 And not meant for trivial or fake 'participation' either. If the influence of observation on the observer is minimized or eliminated, then the 'wrong' kind of control is present, since 'some kind of EXTERNAL [*sic*] type of observation, disconnected and controlled' (Pask 1992) is chosen.

12 The term chaos is used in so-called normal speech to refer to complete disorder, something that does not exist in nature, but can only be deliberately constructed by humans, usually through negligence, for the sake of economic and political camouflage, or our wasteful patterns of designed obsolescence. The term is used in this text to denote that type of order that we are not used to, i.e., the difference between what we think we know and what we still have to discover.

13 I believe that Stafford Beer (2004:858) answered the question, what is cybernetics?, and supplied a solution to the problem of 'a lingua franca in which to talk cybernetics' with his concept of intrinsic control.

14 It's rather ironic, then, that meta- also denotes 'something of a higher or second-order kind' – *COED*.

15 If I/you control you/me too much you/I will cease to communicate, and if you/I do not allow me/you to communicate, I/you will lose control.

16 'The most successful kind of control is one built into the very process of going out of control' (Beer 2004:858).

17 Neither a black (opaque to observation) nor a white (transparent) box.

18 The alternative to the (behaviourist / strict cognitivist) 'input/output type of observation ... is a transaction, an interaction ... which we choose to call a CONVERSATION [*sic*] between PARTICIPANTS [*sic*]' (Pask, 1992).

19 Beer's description of Conant and Ashby's (1970) theorem of regulation, and my interpretation of Beer, differs from their use of the term 'the regulator as an object' (i.e., the control tower of an airport), and definitely differs from the original mention of a 'good regulator' as one that relates to the system within which it operates to the extent of

producing an optimal (maximally successful) outcome. However, the corollary drawn by Conant and Ashby to the living brain is equivalent to transforming a theorem from a first-order application to a second-order interpretation: for the human brain to function autopoietically it '*must* proceed, in learning, by the formation of a model (or models) of its environment'. We, as thinking human beings, must become our own regulators-for-survival. Ashby's first-order Law is not applicable to design as here described, but his second-order corollary does point the way to intrinsic control.

20 A principle of autopoiesis is that you only participate to the extent that you participate (Maturana & Varela 1980:xxv), which means that each conversational partner acquires the 'relations proper' to the design conversational context.

21 Both Jenlink and Banathy (2004) argue for the design conversation to be seen as a social systems design.

22 Habermas recognised the relativity of an everyday multigroup approach as having the most legitimacy, and argued that 'the logic of social explanation is pluralistic and eludes the 'apparatus of general theories' (Bohman 2007).

23 Based on quantum physics and on the work of Prigogine (1980:89-90), I argue for design (knowing) becoming a wavefunction that merges with other wavefunctions, a state of being in which Prigogine's notion of irreversible processes start, at that razor's edge between order and chaos (the 'new order' that we cannot see, yet). It is true that at that *moment of recognition* another process starts where the previous one ends, except that there is no ending but only a moving from place to place, a phase transition from the old to the new. At that moment (too brief to 'see' or comprehend if you don't know that this is possible) all wavefunctions cease to be observable, and we may speak of an inbetween state of being called a Petrovksy lacuna, a condition under which a wavefront's 'wake' (the information it contains) disappears and we can observe nothing, until the moment passes, and we find that we are not the same. Design and designers that transcend their own boundaries, their wavefunctions, become metadesigns, become the functional form of cybernetics, but they first have to transverse (turn and cross) this space of nothingness in the wake of former ways of knowing. We become who we 'are' and have always potentially been.

24 The essentials of *The Nicomachean Ethics* is rendered in Aquinas's social theory as two-dimensional order: *co-ordination and an intelligible relationship* (Finnis 1998:35-37).

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