Cybernetics and Ethics

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Preamble

Cyberculture, an increasingly important phenomenon that includes elements as diverse as email and chat rooms, electronic commerce and gaming, virtual reality and digital politics, has its origins not just in computers but in the lesser known field of cybernetics (from which it takes its name). Cybernetics is defined classically as the study of "control and communication in the animal and the machine" (Wiener 1948). After the decline of classical cybernetics, the field underwent a rebirth as "second order cybernetics" in the 1970s. Second order cybernetics is more obviously closely involved with ethics than classical cybernetics (and certainly promotes a radically different world-view), but both have important contributions to make to reflections on science, technology, and ethics.

Cybernetics

Cybernetics was originally promoted by the mathematician Norbert Wiener (1894 to 1964) in his eponymous 1948 book (although Ashby 1956 provides the classic introductory text). Its terms (including goals and purposiveness, feedback, and mechanism as metaphor) had been previously used, as was the concept of control as attaining and maintaining desired states, rather than restricting the actions of others, but not as concepts forged into a coherent whole, or field. Two groups were particularly important: the informal association of Wiener, Arturo Rosenblueth and Julian Bigelow at MIT; and the Josiah Macy Jr Foundation meetings on "Circular, Causal and Feedback Mechanisms" (which assumed the supertitle "Cybernetics" on the publication of Wiener's book), including Warren McCulloch and Walter Pitts, Margaret Mead, Gregory Bateson, Heinz von Foerster, and Wiener and Rosenblueth.

Cybernetics, a term deriving from the Greek kybernetes—meaning helmsman—examined the behaviour of (often complex) systems to develop models to improve system performance. The models were based on a notion of universally applicable mechanism: no essential differentiation was made between animate and inanimate systems. Examination of behaviours meant seemingly impossibly complex or obscure systems no longer needed to remain so. If cyberneticians could not see what constituted a system, they could treat the system as a black box which, through careful study of the inputs and consequent outputs could be notionally Whitened to the point that a viable mechanism relating input and output could be identified and modelled, even though the actual mechanism remained unknown. The intention was that systems would become controllable or better able to achieve the aims for which they were intended. The systems cyberneticians studied were assumed to have observer-defined goals. Potential for error was understood to be omnipresent. To correct an aberration in the behaviour of a system, differences between the (hypothesised) goal and behaviour were examined, and the system adjusted to compensate for the difference (error). The process of error determination and correction continued until the system began to attain (and continue to attain) its goal.

Although the physical systems initially considered by cyberneticians were military and mechanical (starting with anti-aircraft guns and developed in W. Grey Walter's "Tortoise" and W. Ross Ashby's "Homeostat," as much as the computer and the robot), the animate quickly grew to be of equal significance. Application to social, anthropological, and psychological issues was pursued by Mead and Bateson (Bateson 1972), specially in regard to mental health issues—which concern Bateson shared with Ashby, also a psychologist.

Management cybernetics was born of Stafford Beer (1926 to 2002) in the 1960s, and Gordon Pask (1928 to 1996) began cybernetic studies of teaching and learning in the 1950s.

There are many similarities between classical cybernetics and the slightly later mathematical theory of communication, or information theory, of Claude Shannon and Warren Weaver; and general systems theory and its siblings, systems science etc. as developed by Ludwig von Bertalanffy, making differentiation between these approaches difficult. Which term is used is frequently no more than a personal preference or historical accident. All of these approaches made notable contributions to such scientific and technological understandings and developments as the relationship between wholes and parts, automated control systems, approaches to complexity, developments in computing and communications hard and soft ware, and homeostasis in biological systems—to list but a few.

Early on, Wiener recognised ethical dangers in the cybernetic approach. The conjunction animal and machine, even used metaphorically, has ethical implications—especially when the metaphor is predominantly of the animal as machine rather than the machine as animal. Another typical (and well-known) danger is that associated with the power of the machine (see Asimov's "Three Laws of Robotics"). Wiener's "Human Use of Human Beings" (1950) is his attempt to come to terms with the most important of these dangers. He was not alone in this awareness. However, these ethical considerations are not peculiar to cybernetics.

Second Order Cybernetics

The initial promise of cybernetics was more than could be delivered, and the subject fell out of favour. By 1970 its funding base had eroded (with assistance from the Mansfield Agreement). For some cyberneticians this indicated retrenchment, for others reconsideration leading to a new beginning, second order cybernetics (Glanville 2002). The critical insight differentiating second order cybernetics from classical (first order) cybernetics is that second order cybernetics takes cybernetic circularity more seriously.

Classical cybernetics exists within a world-view in which energy considerations reign paramount. The feedback loop is understood as requiring insignificant amounts of energy, thus creating a hierarchy. The controller, using relatively (and ignorably) little energy, controls the controlled, which is the big energy using part of the system. In second order cybernetics, form and information are considered in preference to energy. In a second order cybernetic control loop, the information passed between controller and controlled is understood as of equal status. First order hierarchy disappears. Each component in the loop contributes to the control of the whole. In effect, each component controls the other and the controller/controlled distinction is seen as a matter of role. The circular form of the cybernetic system is no longer disguised.

The difference was not initially presented this way. The originator of second order cybernetics, von Foerster (1911 to 2002) differentiated thus:

> First order cybernetics—the cybernetics of observed systems
> Second order cybernetics—the cybernetics of observing systems.

However, these two characterisations appear similar if we treat "observe" and "control" as interchangeable verbs, and remember that the observing/controlling system is observing/controlling the observed/controlled system in order to develop understanding, which requires feedback! Furthermore, these concerns are similar to those expressed in the involved observer

of Ernst von Glasersfeld's radical constructivism (1987).

The circular systems of second order cybernetics are essentially autonomous. Their stability derives from their (internal) maintenance of their circular processes. To an external observer they may appear to veer wildly. An example is the autopoietic system of Humberto Maturana, Francisco Varela, and Ricardo Uribe. This system constructs and then maintains itself, providing a model of "life"—or, rather, "living." Such systems are said to be organisationally closed but informationally open: the form of the system maintains (distinguishes) itself, and is in this manner autonomous (Maturana and Varela 1992). Information enters, passes through (is processed by) and exits: the system maintains (distinguishes) itself as itself.

Because these systems are autonomous (i.e., as Maturana and Varela asserted, "organisationally closed but informationally open"), any meaning the information passing through them may have is unique to each system. Communication between these systems cannot be by transmission of meaning because each system builds its own meaning: meanings are not communicated. Uncoded communication may, however, occur through conversation. Gordon Pask's conversation theory (a formalised version of everyday conversation developed, initially, to support communication in learning environments) provides a structure to sustain communication which is formally equivalent to the other circular systems of second order cybernetics (Glanville 1997).

Admitting autonomy and conversation requires a system which accepts that, individually, we see differently and understand uniquely, while acting as though we believe the objects we observe are the same. Otherwise, our relativism would lead to isolation because we have nothing communicable and there is no one to communicate with. Glanville's theory of Objects (1975) provides the framework that allows us to believe we each make different observations of the world, yet can act as if observing the same "Object"—the essential conceptual basis making second order cybernetics and its ethical implications viable.

Second order cybernetics has made notable contributions to our understand in the areas of learning, conversational communication and emergence—amongst others. In particular, though the concepts and mechanisms of autopoiesis, it has helped us understand how social systems acquire stability. However, it is probably better thought of more as a way of understanding than a technology.

Ethics

There are those who would argue that, perhaps more than any other scientific or technological field, second order cybernetics constitutes an effort to develop a scientific basis for ethics. As such it constitutes an important contribution to any discussion concerned with science, technology and ethics. This section sketches the basis of this contribution.

Second order cybernetics' circular systems are autonomous—the staring point for the ethical implications of Second Order Cybernetics. Von Foerster was among the first to register the ethical dimension in "On constructing a reality" (von Foerster 1973) and, particularly, his "Ethics and second order cybernetics" (von Foerster 1992). (Von Foerster's contemporaneous German book "KybernEthik" originated the term "CybernEthics.")

He proposed two imperatives:

> *Ethical imperative:*

Act always so as to increase the number of choices.

Aesthetical imperative:

If you desire to see, learn how to act.

The ethical imperative insists we understand cybernetics has a dimension in ethics. Cybernetics implies generosity, increasing options. Von Foerster contrasted the essential meanness of morality (restrictions applied to others) to the generosity of ethics (which comes from within.)

The origin of this ethical concern can be seen to lie in the age-old question of what reality, if any, we can know independent of our knowing (i.e., is there a mind independent reality (MIR)). Although nowadays we generally make a strong assumption of MIR, the question is in principle undecidable. Von Foerster remarked "only we can decide the undecidable," leaving responsibility for answering this question (hence, how we act) with each individual: we pursue whichever option we chose. Our approach to our world starts from this choice.

In second order cybernetics, our understanding of the world may be said to derive from a position of essential ignorance. The black box provides a mechanism for this (Glanville 1982). The understanding an observer builds through interacting with experience is (in the back box model) tentative: a reliable description of behaviour emanating from the box may suggest it has been whitened, but nothing about the black box and our relationship to it has changed. It remains unopened (and unopenable)—provisional, as black as ever. Knowledge gained from using this model is based in profound ignorance. We cannot, therefore, insist on rightness and should tread warily, respecting the different views of others. The ethical implication of ignorance is respect for the views of others since we can never be certain, ourselves. The views of others are considered as equal in stature to our own—which does not mean theirs (or ours) are either correct or viable.

Furthermore, the relationship between the behaviours (or signals) we call the input and the output that black boxes are taken to act on—causing input to become output—results from interaction between observers and their own black box. Causality and its legal counterpart, blame are seen to arise not from mechanism but from patterns observed by observers. The value of this understanding in how we act cannot be over-emphasised, and is confirmed in many psychotherapies that depend for their effectiveness on persuading us the blaming causality we see is our construction and responsibility. It is not what happens to us that matters, but how we respond to it.

The black box model requires that we distinguish: if there is no distinction between behaviours there is nothing to experience. In essence, why distinguish myself if I am alone? Distinguishing myself, I distinguish myself also from an other (Glanville 1990). This act of distinguishing brings into being and implies mutualism: whatever qualities may be attributed to one side of the distinction may (but need not) be attributed to the other. What I take for myself I may give you: von Foerster's ethical imperative again.

Distinctions, made in observing, can be considered a basis by which observers construct experience, including experience of themselves. In order to assume experience is not solipsistic we assume that the other constructs (its experience of) itself (and us) in a reciprocal manner—another form of mutuality. Self-construction and maintenance indicate organisational closure: there is a boundary (it distinguishes its self) and the system is autonomous. An autonomous system is responsible. It has built itself, maintains itself (is

organisationally closed), while it remains informationally open (communicates with its environment, thus substantiating the claim that, in distinguishing, we both distinguish and distinguish from). Bateson brings these ideas together when he uses the notion of difference (distinction) to define information: the difference that makes a difference (Bateson 1969). The acceptance of responsibility grows out of autonomy (von Foerster 1972): autonomous systems are responsible for their actions. Here is the source of the aesthetical imperative.

There remains communication—that is, conversation. When we understand communication as individual construction of—and responsibility for—meaning and understanding by each participant (rather than the transmission of meanings and understandings), we can see that to understand the other we trust their good-will, acting with generosity, trust, honesty and openness to build the understandings we will map onto each other's. This is an interaction. Teaching and learning (and much else beside) are interactive—the reason Pask developed conversation theory.

In turn, this understanding tells us that all we know requires an observer's (knower's) presence, an understanding crucial in how we treat learning. Maturana said "Everything said is said by an observer." Von Foerster retorted "Everything said is said to an observer." Respecting the observer is an ethical behaviour.

Conclusion

Second order cybernetics implies we are willing to treat each other, and (other, second order) cybernetic systems, with a good-will and generosity that can and should be understood as Ethical implications. These go against some of the meaner understandings we currently and fashionably hold about our position in the world. Second order cybernetics gives us in the ethical arena, hope and delight: those behaviours that we often consider higher, more civilised and better are assumed and sustained in this way of understanding—a better than good reason for taking its lessons seriously.

Main text: 2396 words

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