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On the Origins of Cognitive Science: The Mechanization of the Mind. By Jean-Pierre Dupuy, translated by M. B. DeBevoise. (Cambridge, Mass.: MIT Press, 2009. xviii + 210 p., notes, bibl., index. ISBN 978-0-262-51239-8 $25.00)

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eagerness to publicize the work of his museum, his collaboration with local "informants" pioneered in what would now be called collaborative anthropology. George Hunt, long-time collaborator of Boas, and his wife served as important "cultural intermediaries," both for film production and for the public image of contemporary cultural vitality and agency. The message was mixed, however. Sandra Dyck argues that the nascent tourist industry as well as the emerging Canadian art culture foregrounded landscape and eclipsed the people, both appropriating and popularizing Native Canadian traditional ways of life.

Space does not allow consideration of each paper, particularly those that frame Barbeau among other contemporary creators of Canadian modernism. Various papers deal in detail with his relations to the Group of Seven, for example. Readers will find nuggets of expert analysis and reframing of contemporary relevance alongside the facts and chronicles of more conventional history.

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On the Origins of Cognitive Science: The Mechanization of the Mind. **By Jean-Pierre Dupuy, translated by M. B. DeBevoise**. (Cambridge, Mass.: MIT Press, 2009. xviii + 210 p., notes, bibl., index. ISBN 978-0-262-51239-8 $25.00).

Before the rise of cognitive psychology and functionalism in the philosophy of mind and throughout the waning heyday of behaviourism, there was a movement whose name remains familiar but which has largely fallen out of sight and mind. In a much needed historical and philosophical study, Jean-Pierre Dupuy makes a persuasive case that this movement, broadly known as Cybernetics, was critical in the rise of cognitive science and also played a formative role in nothing less than a transformation of our own human self-image—one which Dupuy regards as highly unfortunate.

Cybernetics can be crudely characterized as the investigation of one idea: feedback. Although the construction of machines that regulate themselves via a feedback control mechanism goes back to antiquity it has been authoritatively stated that the abstract concept of feedback is a distinctive "achievement of the 20th century."[1] Cybernetics hoped for a general mathematical account, and development, of this concept which would usher in a revolution in all of the physical, social and human sciences.

As Dupuy points out, the originators of Cybernetics were among the most gifted scientific thinkers of the last century, including among many others Norbert Weiner, who coined the term "cybernetics" and provided

1 . Otto Mayr, *The Origins of Feedback Control* (Cambridge, MA: MIT Press), 129.

spectacular foundational work; John von Neumann, who sought for a way to grapple with complex dynamical systems and was keenly interested in mechanizing heretofore biological properties (such as reproduction); Warren McCulloch and Walter Pitts, who pioneered the science of artificial neural-like networks; and the electrical engineer Heinz von Foerster. There were also famous subalterns who spread the word beyond the domain of hard science, such as the anthropologists Gregory Bateson and Margaret Mead.

Initially full of promise and grandiose dreams, going no less far than the complete understanding of complexity in nature and a blueprint for world peace, cybernetics has faded almost completely from the intellectual scene. Although Dupuy gestures towards a kind of cybernetical renaissance in modern work in connectionism, self-organization and autopoiesis (notably in the work of Francisco Varela), the rebirth is less a continuation of cybernetics so much as novel research in which links to cybernetics can be discerned (sometimes with some straining).

Two natural questions immediately arise. The first is: what killed cybernetics? The second is: what was the project of cybernetics? Dupuy's carefully worked out answer to the first question can be brutally summarized in terms of the arrogance and intellectual imperialism of the standard bearers of cybernetics. Dupuy notes numerous places where cybernetics could have fruitfully engaged with other areas of thought, notably biology, but instead tended to regard itself as the sacred carrier of the one true path to enlightenment. Over time such an attitude, coupled with the repeated failure to produce any actual solutions to real problems, either technological or scientific, doomed cybernetics to marginalization. Dupuy sarcastically points out that "practically the only discipline to host cybernetic meetings at the end of the 20th century" (p.145) is family psychotherapy.

The answer to the second question is much more involved and nuanced. Dupuy argues that cybernetics had two principal philosophical goals which were deeply intertwined. It is important to point out that, as is typical for a self-proclaimed scientific revolution, these philosophical aspirations were never fully or clearly articulated. The first goal was the advancement of a physicalist account of nature. Cybernetics was to be the guide to linking all domains to that of physics. This is somewhat at odds with the standard myth of cybernetics, which tends (anachronistically) to see cybernetics as involving the recognition of complexity and emergence in opposition to purely physics based models of reality. But Dupuy makes a strong case that the cyberneticians, or at least most and the most influential of them, saw cybernetics as continuous with physics. Other disciplines, biology and most especially psychology were to be superseded in the cybernetic vision of the world. The cyberneticians' view of psychology was straightforward:

"they saw it above all as a territory to be conquered, as a rival to be vanquished" (p.84). Cyberneticians tended to dismiss biological and neurological characterizations in favour of a purely logical or mechanistic understanding of network structure (always embodying the system of feedback control), as in the model neurons studied by McCulloch and Pitts. The second goal was a psycho-metaphysical one: the mechanization of man. This goal had several facets. One was the explicit desire for a feedback control mechanism model of the mind and the naturalization of mental teleology. Prior to formulating cybernetics as such, during World War Two Weiner hoped that his vision of feedback control could make a significant contribution to the allied effort. In particular, he worked on developing an aiming device for anti-aircraft guns that would 'anticipate' the diversionary maneuvers of enemy pilots. Peter Galison has explored how the AA predictor project stood proxy for the entire cybernetics movement in all its grotesque grandiosity: "the AA predictor, along with its associated engineering notions of feedback systems and black boxes, became, for Wiener, the model for a cybernetic understanding of the universe itself."[1] The AA predictor, though successful in simplified tests for short prediction times and theoretically suggestive, never achieved any practical usefulness.

Dupuy traces how the cybernetic influence on philosophy, especially in continental Europe, linked with and funded the idea of "subjectless processes" (p.155 ff.). It was now possible for mental states and psychological transitions to be considered as ideal and mechanical, without any need to associate with them a subject or centre of experience. As usual, cybernetics refused to enter serious dialogue with the disciplines most amenable to this idea and lacked the conceptual machinery even to understand what it was really about. As Dupuy puts it, "cybernetics […] came very close to announcing the dehumanization of man" but adds that "one wishes it had been aware of this" (p.158). But its influence was significant, albeit more or less subliminal, both in the phenomenological tradition and in the development of the functionalist theories of mind of Anglo-American analytic philosophy.

This outline barely touches on the depth of analysis and historical insight of Dupuy's work, which surely stands as the best account of the important but neglected influence of cybernetics on what we have come to call cognitive science.

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1. Peter Galison, "The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision," *Critical Inquiry* 21, 1 (1994): 229.