

UNIVERSITÉ PARIS I PANTHÉON SORBONNE

UFR 02 : Sciences économiques

Master 2 : Économie et sciences humaines

2018–2019

VERS LA MACHINE À GOUVERNER

Herbert Simon and the Impossibility of a Democratic
Computer

Présenté et soutenu par :
Carlos Alberto Rivera Carreño

Directeur de mémoire :
Jean-Sébastien Lenfant

L'Université Paris 1 Panthéon Sorbonne n'entend donner aucune approbation, ni désapprobation aux opinions émises dans ce mémoire ; elle doivent être considérées comme propres à leur auteur.



This text is free : you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 3 of the License or any later version.

This text is distributed in the hope that it will be useful, but **without any warranty** ; without even the implied warranty of **merchantability or fitness for a particular purpose**. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this text. If not, see <http://www.gnu.org/licenses/>.

Copyright ©SYNCO 2018.

Contents

1	INTRODUCTION	5
	Accroche : Metaphors in Economics	5
	Rethinking Work in the 21st Century	5
	Structure of the Thesis	6
2	THE CONCEPTUAL ORIGINS OF THE COMPUTER	9
	Did Adam Smith Invent the Computer?	9
	Babbage's Thinking Machines	10
	Chapter Conclusion	10
3	THE BUREAUCRACY AS MODEL COMPUTER	13
	The Mind and the Computer	13
	Dichotomy: Natural and Artificial	13
	Chapter Conclusion	13
4	CONCLUSION	17

Introduction

ACCROCHE : METAPHORS IN ECONOMICS

In the *accroche*, I will describe how something as self-evident as labor is in fact an ideological construct (ideological in the sense of the anthropologist Louis Dumont, and not in the Marxist sense). Therefore, I will briefly indicate that the concept of Labor begins in political economy and is then appropriated by natural science to be reimported into economic science.

Likewise, I will indicate that the motivation for the the thesis is to rethink what Labor is in the 21st century, taking into account the ubiquity of information technologies.

This section will introduce the topic of metaphors in economic thought, since the main issue of the thesis is to provide historical and conceptual elements to understand the transformations of labor in the age of artificial intelligence and computer and information technologies (ICTs).

This thesis takes the position that metaphors and analogies play an important role in the way scientific concepts are

understood such as in pedagogical examples and functional analogies.

I will state that both labor and the computer are not things but concepts, and that their definitions must be approached historically. This chapter will define the early computer as a conception of the organization of work that reflects an engineering and managerial mentality. Likewise, this chapter will hint at the link between this conception of work and its definition in law as a relation of subordination. In the last part of the introduction, I will summarize the arguments of the three chapters and hint at the conclusion.

RETHINKING WORK IN THE 21ST CENTURY

In this section, I will state the main argument of the thesis: namely, that the origin of the computer is a particular conception of the organization of labor, which we should take into account to understand the transformation of labor (its forms, its meaning, its formal definition in law, etc.) in the 21st century. As such, this argument calls into question the “popular” under-

standing of the one-sided transformation of labor by the appearance and dissemination of information and communication technologies (ICTs) in the mid 20th century. Instead, this thesis proposes to read the computer as a technology for organizing labor, to then use this reading to understand the transformation of labor that ICTs are supposedly pushing for.

STRUCTURE OF THE THESIS

The second chapter will describe Herbert Simon's interest in Babbage, and will speculate on how this reading shaped Simon's conception of the computer, the relation between the natural and the artificial, the changes in work produced by new technologies (artificial intelligence, computers, and automation), and the organization of work in society. Moreover, this chapter will criticize Simon's idea that the organization of work is a purely technical problem to propose an alternative view of work that emphasizes other criteria for organization such as justice, etc.

REFERENCES

- brenner2006** Anastasios Brenner. "Quelle épistémologie historique?: Kuhn, Feyerabend, Hacking et l'école bachelardienne". French. In: *Revue de métaphysique et de morale* 49.1 (2006), pp. 113–125.
- deutsch1951** Karl Wolfgang Deutsch. "Mechanism, Organism, and Society: Some Models in Natural and Social Science". In: *Philosophy of Science* 18.3 (1951), pp. 230–252.
- dijksterhuis1950** Eduard Jan Dijksterhuis. *The Mechanization of the World Picture*. Trans. from the Dutch by C. Dikshoorn. 1st ed. Oxford: Oxford University Press, 1961 [1950].
- maas_duppe2017** Harro Maas and Till Düppe. "The Historical Epistemology of Economics: An Invitation". In: *Including a Symposium on the Historical Epistemology of Economics*. Ed. by Luca Fiorito and Scott Scheall. 1st ed. Vol. 35A. Research in the History of Economic Thought and Methodology. Chicago, New York: Emerald Publishing Limited, 2017, pp. 3–9.
- maas2005_11** Harro Maas. "The Image of Economics". In: *William Stanley Jevons and the Making of Modern Economics*. 1st ed. New York: Cambridge University Press, 2005. Chap. 11, pp. 278–290.
- mirowski1994_1** Philip Mirowski. "Doing What Comes Naturally: Four Metanarratives on What Metaphors are for". In: *Natural Images in Economic Thought: Markets Read in Tooth & Claw*. Ed. by Philip Mirowski. 1st ed. Historical Perspectives in Modern Economics. Cambridge University Press, 1994. Chap. 1, pp. 3–51.
- norton_smith1989_1** Matthew Norton Wise and Crosbie Smith. "Work and Waste: Political Economy and Natural Philosophy in Nineteenth Century Britain (I)". In: *History of Science* 27.3 (1989), pp. 263–301.
- norton_smith1989_2** Matthew Norton Wise and Crosbie Smith. "Work and Waste: Political Economy and Natural Philosophy in Nineteenth Century Britain (II)". In: *History of Science* 27.4 (1989), pp. 391–449.

- norton_smith1989_3** Matthew Norton Wise and Crosbie Smith. "Work and Waste: Political Economy and Natural Philosophy in Nineteenth Century Britain (III)". In: *History of Science* 28.3 (1989), pp. 221–261.
- oliveira2014_7** Agamenon Oliveira. "The Metamorphosis of the Work Concept and its Incorporation into Economic Thought". In: *A History of the Work Concept: From Physics to Economics*. Ed. by Marco Ceccarelli. Vol. 24. History of Mechanism and Machine Science. Dordrecht, Heidelberg, New York, London: Springer, 2014. Chap. 7, pp. 181–218.
- oliveira2014_8** Agamenon Oliveira. "Conclusions". In: *A History of the Work Concept: From Physics to Economics*. Ed. by Marco Ceccarelli. Vol. 24. History of Mechanism and Machine Science. Dordrecht, Heidelberg, New York, London: Springer, 2014. Chap. 8, pp. 219–238.
- picon1992_1** Antoine Picon. "Pour une histoire de la rationalité technique". French. In: *L'invention de l'ingénieur moderne: L'École des Ponts et Chaussées 1747-1851*. 1st ed. Paris: Presses de l'école nationale des ponts et chaussées, 1992, pp. 13–25.
- rabinbach2018_7** Anson Rabinbach. "Metaphors of the Machine in the Post-Fordist Era". In: *The Eclipse of the Utopias of Labor*. 1st ed. Forms of living. New York: Fordham University Press, 2018. Chap. 7, pp. 160–179.
- rabinbach2018_preface** Anson Rabinbach. "Preface". In: *The Eclipse of the Utopias of Labor*. 1st ed. Forms of living. New York: Fordham University Press, 2018, pp. 8–39.
- vatin_pillon2003_1_1** François Vatin and Thierry Pillon. "Genèse de la notion de travail". French. In: *Traité de sociologie du travail*. Ed. by François Daniellou, Gilbert Terssac, and Yves Schwartz. 2nd ed. Collection travail et activité humaine. Toulouse: OCTARES Éditions, 2007 [2003]. Chap. 1.1, pp. 5–17.
- vatin_pillon2003_1_2** François Vatin and Thierry Pillon. "Le travail et les sciences de la nature". French. In: *Traité de sociologie du travail*. Ed. by François Daniellou, Gilbert Terssac, and Yves Schwartz. 2nd ed. Collection travail et activité humaine. Toulouse: OCTARES Éditions, 2007 [2003]. Chap. 1.2, pp. 18–39.
- vatin_pillon2003_1_3** François Vatin and Thierry Pillon. "Le travail saisi par l'économie politique". French. In: *Traité de sociologie du travail*. Ed. by François Daniellou, Gilbert Terssac, and Yves Schwartz. 2nd ed. Collection travail et activité humaine. Toulouse: OCTARES Éditions, 2007 [2003]. Chap. 1.3, pp. 40–62.
- vatin2008b** François Vatin. "L'esprit d'ingénieur: pensée calculatoire et éthique économique". French. In: *Revue Française de Socio-Économie* 1.1 (2008), pp. 131–152.

The Conceptual Origins of the Computer

The first chapter introduces the definition of the early computer as a technology for organizing work. The first objective of this chapter is to question the belief that the appropriate definition of the computer is in terms of its components. The second objective is to acquaint the reader with the history of the early computer by describing the project of the calculation of the logarithmic tables at the *Bureau du cadastre*, and the importance that this project had for Charles Babbage's calculating machines.

concept of the division of labor—as it appears in the pin factory example of the “Wealth of Nations”—to organize a group of hairdressers to produce mathematical tables for the French *Bureau du cadastre*, during the aftermath of the French Revolution. The point is to show that the “computer” is in fact an organization of labor, in which complex calculation tasks are divided into simpler calculation tasks, which are then carried out by unqualified “specialized” workers (or in computer science lingo, by *sub-processes*).

DID ADAM SMITH INVENT THE COMPUTER?

This chapter will open with Simon and Newell's text, “Heuristic Problem Solving”, in which they discuss de Prony's project and its influence on Charles Babbage.

The introduction to this chapter presents the reader with the story of how Gaspard-Clair-François-Marie Riche de Prony was inspired by Adam Smith's

The first section of this chapter contextualizes the story of De Prony, by providing some background information on him and on the project of the calculation of the logarithmic tables. The idea is to provide an understanding of the significance of the project at the time, and the subsequent significance that it had for Charles Babbage.

BABBAGE'S THINKING MACHINES

The second chapter will discuss the question at the heart of Babbage's project: Can machine labor replace human labor?

The second section of this chapter connects De Prony's story with Babbage's design of the Difference and the Analytical Engine. The idea is to connect Babbage's ideas on the organization of work and industry with his thought on calculating devices. Therefore, the concept of *mental labor* will be discussed, as it relates to the 20th century analogy between mind and computer—which is key to the thought of Herbert Simon.

CHAPTER CONCLUSION

REFERENCES

- babbage1832_18** Charles Babbage. "On the Divison of Labour". In: *On the Economy of Machinery and Manufactures*. 1st ed. Cambridge Library Collection. New York: Cambridge University Press, 2009 [1832]. Chap. 18, pp. 131–151.
- babbage1832_19** Charles Babbage. "On the Divison of Mental Labour". In: *On the Economy of Machinery and Manufactures*. 1st ed. Cambridge Library Collection. New York: Cambridge University Press, 2009 [1832]. Chap. 19, pp. 152–163.
- daston1994** Lorraine Daston. "Enlightenment Calculations". In: *Critical Inquiry* 21.1 (1994), pp. 182–202.
- grattan-guinness2003** Ivor Grattan-Guinness. "The Computation Factory: De Prony's Project for Making Tables in the 1790s". In: chap. 4, pp. 105–122.
- lefort1858** Pierre Alexandre Francisque Lefort. "Description des grandes tables logarithmiques et trigonométriques calculées au Bureau du cadastre sous la direction de Prony". French. In: *Annales de l'Observatoire impérial de Paris: Mémoires*. Ed. by Urbain Jean Joseph Le Verrier. 1st ed. Vol. 4. Paris: Mallet-Bachelier, 1858, pp. 123–150. Département sciences et techniques, 4-V-61, BNF.
- maas2005_5** Harro Maas. "Engines of Discovery". In: *William Stanley Jevons and the Making of Modern Economics*. 1st ed. New York: Cambridge University Press, 2005. Chap. 5, pp. 96–122.
- millar1990** Gordon Miller. "Charles Babbage and the Design of Intelligence: Computers and Society in 19th-Century England". In: *Bulletin of Science, Technology & Society* 10.2 (1990), pp. 68–76.
- peaucelle2012a** Jean-Louis Peaucelle. "Un « éléphant blanc » en pleine Révolution Française : Les grandes tables de logarithmes de Prony comme substitut au cadastre!" French. In : *Annales des Mines - Gérer et comprendre* 107.1 (2012), pp. 74–86.
- prony1820** Gaspard-Clair-François-Marie Riche de Prony. *Note sur la publication proposée par le gouvernement anglais des grandes tables logarithmiques et trigonométriques de M. de Prony : Observations sur la proposition de transformer les grandes tables centésimales de M. de Prony en tables sexagésimales*. French. Monographie imprimée. Paris, 1820. Identifiant 4°295/C16, ENPC.
- purbrick1993** Louise Purbrick. "The Dream Machine : Charles Babbage and His Imaginary Computers". In :

Journal of Design History 6.1 (1993),
pp. 9–23.

romano1982 Richard Romano. “The Economic Ideas of Charles Babbage”. In : *History of Political Economy* 14.3 (1982), pp. 385–405.

schaffer1994 Simon Schaffer. “Babbage’s Intelligence : Calculating Engines and the Factory System”. In : *Critical Inquiry* 21.1 (1994), pp. 203–227.

vatn_pillon2003_2_3 François Vatin and Thierry Pillon. “Organisation et rationalisation du travail”. French. In : *Traité de sociologie du travail*. Ed. by François Daniellou, Gilbert Terssac, and Yves Schwartz. 2nd ed. Collection travail et activité humaine. Toulouse : OCTARES Éditions, 2007 [2003]. Chap. 2.3, pp. 162–198.

3

The Bureaucracy as Model Computer

The second chapter describes Herbert Simon's thinking on the computer and organizations to trace the consequences of these ideas into his thinking about the role of artificial systems in shaping the workplace and worker self-determination. Therefore, this chapter will introduce the reader to the importance of Herbert Simon to the field of artificial intelligence, which has been more-or-less ignored by economists—who often only focus on his concept of *bounded rationality*.

THE MIND AND THE COMPUTER

The introduction of this chapter discusses the ambiguous relation between nature and artifice in the thought of Herbert Simon—specially, as it manifests in his understanding of the mind as a computer. The idea is to give the reader enough background information on Simon's general vision of *things* to, then, discuss his think-

ing on the nature of organizations (in the first section).

DICHOTOMY : NATURAL AND ARTIFICIAL

The first section of this chapter connects Simon's ideas on the computer and the mind to his general thinking on organizations. The idea is to pave the way for a political understanding of Simon's more abstract writings on organizations by presenting Simon's own thinking on the concrete social consequences of his vision—which is done in the second section.

CHAPTER CONCLUSION

REFERENCES

ashby1953 William Ross Ashby. *Letter to Herbert Alexander Simon*. June 23, 1953. Box : 91, folder : 7434, HSCM.

- chapanis1961** Alphonse Chapanis. "Men, Machines, and Models". In : *American Psychologist* 16.3 (1961), pp. 113–131.
- crowther-heyck1999** Hunter Crowther-Heyck. "George A. Miller, Language, and the Computer Metaphor of Mind". In : *History of Psychology* 2.1 (1999), pp. 37–64.
- crowther-heyck2005** Hunter Crowther-Heyck. "Mind and Network". In : *IEEE Annals of the History of Computing* 27.3 (2005), pp. 103–104.
- galison1994** Peter Galison. "The Ontology of the Enemy : Norbert Wiener and the Cybernetic Vision". In : *Critical Inquiry* 21.1 (1994), pp. 228–266.
- gigerenzer1996** Gerd Gigerenzer and Daniel G. Goldstein. "Mind as Computer : Birth of a Metaphor". In : *Creativity Research Journal* 9.2 (1996), pp. 131–144.
- heyck2005** Hunter Heyck. *Herbert Simon : The Bounds of Reason in Modern America*. Baltimore : Johns Hopkins University Press, 2005.
- heyck2008** Hunter Heyck. "Defining the Computer : Herbert Simon and the Bureaucratic Mind–Part 1". In : *IEEE Annals of the History of Computing* 30.2 (2008), pp. 42–51.
- heyck2008a** Hunter Heyck. "Defining the Computer : Herbert Simon and the Bureaucratic Mind–Part 2". In : *IEEE Annals of the History of Computing* 30.2 (2008), pp. 52–63.
- licklider1960** Joseph Carl Robnett Licklider. "Man-Computer Symbiosis". In : *IRE Transactions on Human Factors in Electronics* HFE-1.1 (1960), pp. 4–11.
- marshall1977** John Marshall. "Minds, Machines and Metaphors". In : *Social Studies of Science* 7.4 (1977), pp. 475–488.
- otis2002** Laura Otis. "The Metaphoric Circuit : Organic and Technological Communication in the Nineteenth Century". In : *Journal of the History of Ideas* 63.1 (2002), pp. 105–128.
- simon_march1954** Herbert Simon and James March. "The Theory of Departmentalization". Working Paper. 1954. Box : 42, folder 3286, HSCM.
- simon_newell1958** Herbert Simon and Allen Newell. "Heuristic Problem Solving : The Next Advance in Operations Research". In : *Operations Research* 6.1 (1958), pp. 1–10.
- simon_newell1959** Herbert Simon and Allen Newell. *What Have Computers to Do with Management ?* Paper. RAND Corporation, May 21, 1959. Box : 6, folder : 420, HSCM.
- simon1952** Herbert Simon. "A Behavioral Model of Rational Choice". In : *Quarterly Journal of Economics* (1952), pp. 99–118.
- simon1954** Herbert Simon. "Some Strategic Considerations in the Construction of Social Science Models". Paper. 1954. Box : 63, folder : 4824, HSCM.
- simon1954a** Herbert Simon. "Functional Analysis and Organization Theory II". Working Paper. Apr. 30, 1954. Box : 42, folder : 3290, HSCM.
- simon1954b** Herbert Simon. "Functional Analysis and Organization Theory I". Working Paper. Apr. 1, 1954. Box : 42, folder : 3288, HSCM.

- simon1956a** Herbert Simon. "Rational Choice and the Structure of the Environment". In : *Psychological Review* 63.2 (1956), pp. 129–138.
- simon1962** Herbert Simon. "The Architecture of Complexity : Some Common Properties of Complex Systems". In : *Proceedings of the American Philosophical Society : Held at Philadelphia for Promoting Useful Knowledge*. Annual General Meeting (Philosophical Hall, Apr. 26–28, 1962). Vol. 106. 6. The American Philosophical Society. 1962, pp. 467–482.
- simon1983b** Herbert Simon. "What is Industrial Democracy ?" In : *Challenge* (January-February 1983), pp. 30–39.
- simon1991a** Herbert Simon. "Organizations and Markets". In : *The Journal of Economic Perspectives* 5.2 (1991), pp. 25–44.
- simon1991c** Herbert Simon. "Mind as Machine : The Cognitive Revolution in Behavioral Science". In : *Perspectives on Behavioral Science : The Colorado Lectures*. Ed. by Richard Jessor. Boulder, San Francisco, Oxford : Westview Press, 1991, pp. 37–52.
- simon1997** Herbert Simon. "Computer Science as Empirical Inquiry : Symbols and Search". In : *Mind Design II : Philosophy, Psychology, and Artificial Intelligence*. Ed. by John Haugeland. 1st ed. Cambridge, London : MIT Press, 1997 [1976]. Chap. 4, pp. 81–110.
- waring1994_3** Stephen Waring. "Economics and Cybernetics : The Bureaucratic Rationality of Herbert A. Simon". In : *Taylorism Transformed : Scientific Management Theory Since 1945*. The University of North Carolina Press, 1994. Chap. 3, pp. 49–77.

Conclusion