

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 par*

Carlos Alberto Rivera Carreño

*sous la direction de*

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.

`/home/sync0/Dropbox/images/gpl3.png`

As a commitment to free software, this text was composed in GNU Emacs, typeset in 12 pt. Linux Libertine with L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> and KOMA-Script, and compiled in LuaT<sub>E</sub>X.

This text and its source files are free and available for download at :

[https://github.com/sync0/memoire\\_m2](https://github.com/sync0/memoire_m2)

You can redistribute them and/or modify them 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.

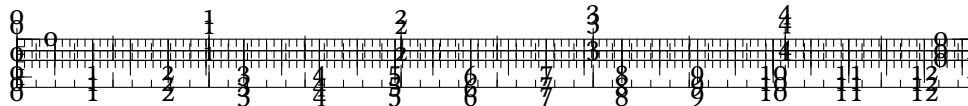
This text and its source files are distributed in the hope that they will be useful, but **without any warranty** ; without even the implied warranty of **merchantability or fitness for a particular purpose**. See the GNU General Public License for more details at :

<https://www.gnu.org/licenses/gpl-3.0.en.html>

©Carlos Alberto Rivera Carreño 2019.

*Nature (the art whereby God hath made and governs the world) is by the art of man, as in many other things, so in this also imitated, that it can make an artificial animal. For seeing life is but a motion of limbs, the beginning whereof is in some principal part within, why may we not say that all automata (engines that move themselves by springs and wheels as doth a watch) have an artificial life ? For what is the heart, but a spring ; and the nerves, but so many strings ; and the joints, but so many wheels, giving motion to the whole body, such as was intended by the Artificer ? Art goes yet further, imitating that rational and most excellent work of Nature, man.*

Thomas Hobbes, *Leviathan*



# Contents

ACKNOWLEDGEMENTS   iii

NOTE AUX LECTEURS FRANCOPHONES   v

PREFACE   vii

1 INTRODUCTION   1

    Structure of the thesis   1

2 WOULD YOU BET AGAINST SEX ROBOTS?   3

    Introduction   3

    The Technicist View   4

    The Historicity of the Wage Relation   10

3 DID ADAM SMITH INVENT THE DIGITAL COMPUTER?   15

    Introduction   15

    Manufacturing Logarithms and Weaving Algebraical Patterns   16

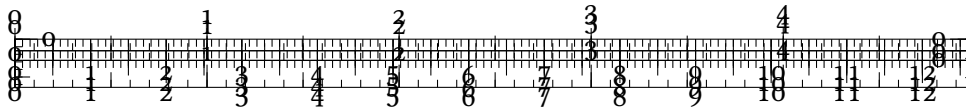
    The Impossibility of a Democratic Computer   23

    Conclusion   27

4 CONCLUSION   29







# Abbreviations

## ARCHIVAL SOURCES

When citing archival materials, I indicate their location within the following archives:

*HSCM*: Herbert Simon Papers, Carnegie Mellon University Archives.

*ENPC* : École nationale des ponts et chaussées.

*BNF* : Bibliothèque nationale de France.

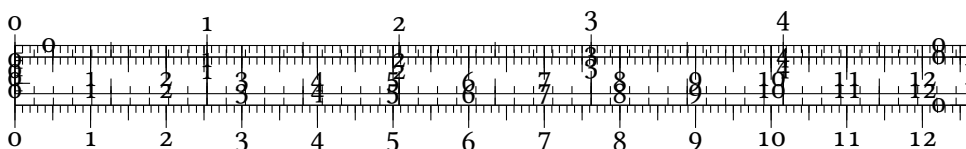
I accessed them through their respective on-line repositories.

*HSCM*: Carnegie Mellon University Libraries Digital Collections.

*ENPC* : Bibliothèque numérique patrimoniale des ponts et chaussées.

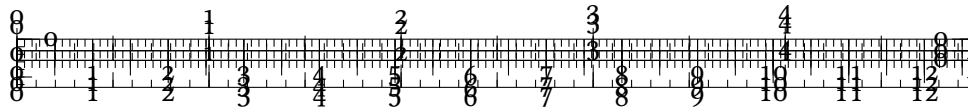
*BNF* : Gallica.

Only the pdf version of this document includes hyperlinks to the source files, when available.









# Acknowledgements

This Master's thesis, even with all its shortcomings, would have been impossible to write without the help of many people.

I would like to thank my Master's thesis adviser, professor Jean-Sébastien Lenfant, for his patience and dedication, and professors Annie L. Cot and Jérôme Llalement for their support to all the students at the *Réseau en Épistémologie et en Histoire de la Pensée Économique Récente* (REHPERE) at Paris 1 University.

The arguments presented herein have been chiseled by the insightful comments and suggestions of Justine Loulergue, Guillaume Noblet, Guillaume Lancereau, Pedro Javier Ortiz, Seung Hoon Hahm, and my fellow students of the M2 *Économie et sciences humaines* at Paris 1.

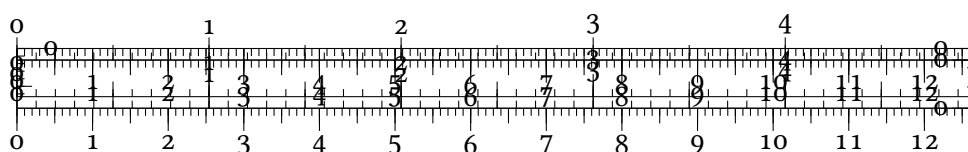
Moreover, rummaging through the Herbert Simon Papers would have been impossible without the assistance of Emily Davis at Carnegie Mellon University Libraries.

I would like to thank my wife's family and my own for their love and support. Last but not least, I would like to thank my wife, Min Jung; this text is dedicated to her.

Carlos Alberto Rivera Carreño

May 26, 2019

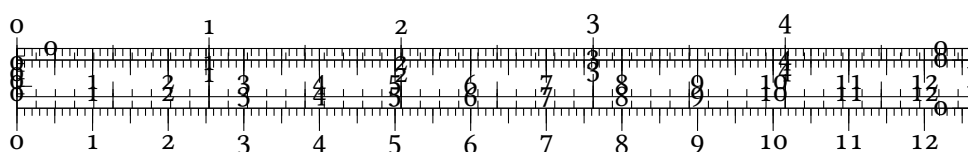
Bagneux, France

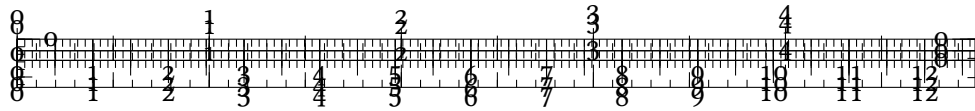






Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tristique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lorem. Sed lacinia nulla vitae enim. Pellentesque tincidunt purus





vel magna. Integer non enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

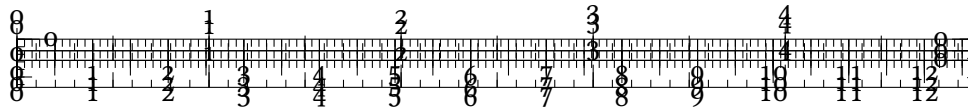
Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae lacus tincidunt ultrices. Lorem ipsum dolor sit amet, consectetur adipiscing elit. In hac habitasse platea dictumst. Integer tempus convallis augue. Etiam facilisis. Nunc elementum fermentum wisi. Aenean placerat. Ut imperdiet, enim sed gravida sollicitudin, felis odio placerat quam, ac pulvinar elit purus eget enim. Nunc vitae tortor. Proin tempus nibh sit amet nisl. Vivamus quis tortor vitae risus porta vehicula.

Fusce mauris. Vestibulum luctus nibh at lectus. Sed bibendum, nulla a faucibus semper, leo velit ultricies tellus, ac venenatis arcu wisi vel nisl. Vestibulum diam. Aliquam pellentesque, augue quis sagittis posuere, turpis lacus congue quam, in hendrerit risus eros eget felis. Maecenas eget erat in sapien mattis porttitor. Vestibulum porttitor. Nulla facilisi. Sed a turpis eu lacus commodo facilisis. Morbi fringilla, wisi in dignissim interdum, justo lectus sagittis dui, et vehicula libero dui cursus dui. Mauris tempor ligula sed lacus. Duis cursus enim ut augue. Cras ac magna. Cras nulla. Nulla egestas. Curabitur a leo. Quisque egestas wisi eget nunc. Nam feugiat lacus vel est. Curabitur consectetur.

Suspendisse vel felis. Ut lorem lorem, interdum eu, tincidunt sit amet, laoreet vitae, arcu. Aenean faucibus pede eu ante. Praesent enim elit, rutrum at, molestie non, nonummy vel, nisl. Ut lectus eros, malesuada sit amet, fermentum eu, sodales cursus, magna. Donec eu purus. Quisque vehicula, urna sed ultricies auctor, pede lorem egestas dui, et convallis elit erat sed nulla. Donec luctus. Curabitur et nunc. Aliquam dolor odio, commodo pretium, ultricies non, pharetra in, velit. Integer arcu est, nonummy in, fermentum faucibus, egestas vel, odio.

Sed commodo posuere pede. Mauris ut est. Ut quis purus. Sed ac odio. Sed vehicula hendrerit sem. Duis non odio. Morbi ut dui. Sed accumsan risus eget odio. In hac habitasse platea dictumst. Pellentesque non elit. Fusce sed justo eu urna porta tincidunt. Mauris felis odio, sollicitudin sed, volutpat a, ornare ac, erat. Morbi quis dolor. Donec pellentesque, erat ac sagittis semper, nunc dui lobortis purus, quis congue purus metus ultricies tellus. Proin et quam. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Praesent sapien turpis, fermentum vel, eleifend faucibus, vehicula eu, lacus.





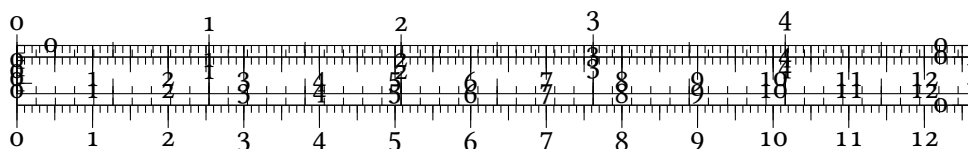
## Preface: Science and History

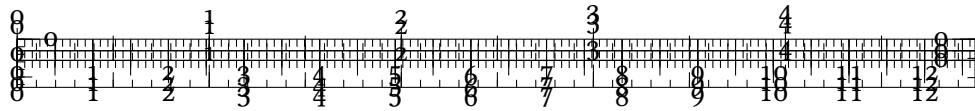
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tristique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lorem. Sed lacinia nulla vitae enim. Pellentesque tincidunt purus vel magna. Integer non enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae lacus tincidunt ultrices. Lorem ipsum dolor sit amet, consectetur adipiscing elit. In hac habitasse platea dictumst. Integer tempus convallis augue. Etiam





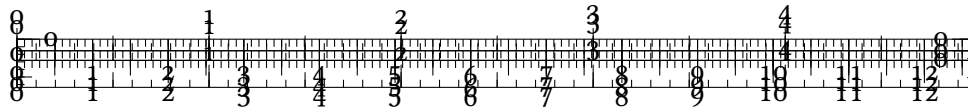
facilis. Nunc elementum fermentum wisi. Aenean placerat. Ut imperdiet, enim sed gravida sollicitudin, felis odio placerat quam, ac pulvinar elit purus eget enim. Nunc vitae tortor. Proin tempus nibh sit amet nisl. Vivamus quis tortor vitae risus porta vehicula.

Fusce mauris. Vestibulum luctus nibh at lectus. Sed bibendum, nulla a faucibus semper, leo velit ultricies tellus, ac venenatis arcu wisi vel nisl. Vestibulum diam. Aliquam pellentesque, augue quis sagittis posuere, turpis lacus congue quam, in hendrerit risus eros eget felis. Maecenas eget erat in sapien mattis porttitor. Vestibulum porttitor. Nulla facilisi. Sed a turpis eu lacus commodo facilisis. Morbi fringilla, wisi in dignissim interdum, justo lectus sagittis dui, et vehicula libero dui cursus dui. Mauris tempor ligula sed lacus. Duis cursus enim ut augue. Cras ac magna. Cras nulla. Nulla egestas. Curabitur a leo. Quisque egestas wisi eget nunc. Nam feugiat lacus vel est. Curabitur consectetur.

Suspendisse vel felis. Ut lorem lorem, interdum eu, tincidunt sit amet, laoreet vitae, arcu. Aenean faucibus pede eu ante. Praesent enim elit, rutrum at, molestie non, nonummy vel, nisl. Ut lectus eros, malesuada sit amet, fermentum eu, sodales cursus, magna. Donec eu purus. Quisque vehicula, urna sed ultricies auctor, pede lorem egestas dui, et convallis elit erat sed nulla. Donec luctus. Curabitur et nunc. Aliquam dolor odio, commodo pretium, ultricies non, pharetra in, velit. Integer arcu est, nonummy in, fermentum faucibus, egestas vel, odio.

Sed commodo posuere pede. Mauris ut est. Ut quis purus. Sed ac odio. Sed vehicula hendrerit sem. Duis non odio. Morbi ut dui. Sed accumsan risus eget odio. In hac habitasse platea dictumst. Pellentesque non elit. Fusce sed justo eu urna porta tincidunt. Mauris felis odio, sollicitudin sed, volutpat a, ornare ac, erat. Morbi quis dolor. Donec pellentesque, erat ac sagittis semper, nunc dui lobortis purus, quis congue purus metus ultricies tellus. Proin et quam. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Praesent sapien turpis, fermentum vel, eleifend faucibus, vehicula eu, lacus.





# 1



## Introduction

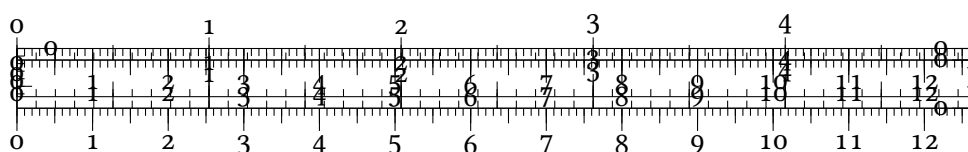
TS: The dominant “technicist” view of the influence of ICTs on the future of work and its organization is inadequate because it ignores that thoughts on machine intelligence, automation, and sociotechnical systems for the conduct of workers have been strongly connected since at least the nineteenth century.

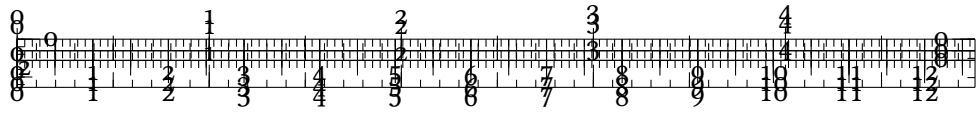
That said, fears of human redundancy are not new, since already in the 19<sup>th</sup> Sismondi was preoccupied at the unemployment caused by the greater productivity of automatic machinery, he was outraged at the possibility that “the King, alone in an island constantly turning a handle, carry out with automaton all the work of England.” Sismondi 1819, p. 330, my translation.

### STRUCTURE OF THE THESIS

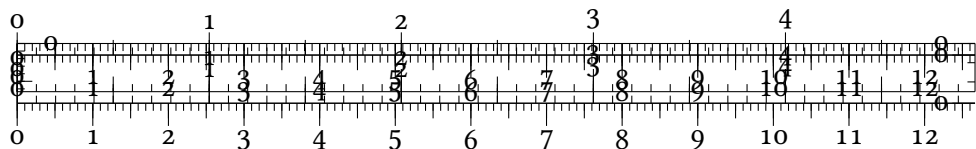
As the recurring interest in de Prony’s project for the calculation of the logarithmic tables shows, the dominant “technicist” view of the influence of ICTs on the future of work and its organization is inadequate because it ignores that thoughts on machine intelligence, automation, and sociotechnical systems for the conduct of workers have been strongly connected since at least the nineteenth century.

In chapter one, I (1) explain what the dominant “technicist” view is, and (2) criticize it the best I can to show that it is inadequate. The first part of chapter one explains what the technicist view is, and uses the example of Autor’s article as an ideal-type of this view. The second part of chapter one criticizes the technicist view by showing that it ignores the conventionalist dimension of the wage relation. This is done by discussing the social embeddedness of work in history, culture, and western ideology and discussing the example of the work contract by Supiot.



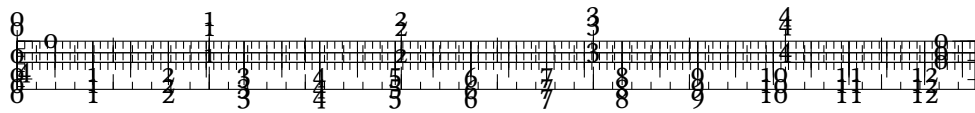


In chapter two, I should sketch a different view (to the dominant technicist one) by explaining how the recurring interest in de Prony's project shows that thoughts on machine intelligence, automation, and sociotechnical systems for the conduct of workers have been connected since at least the nineteenth century. The first part of chapter two shows that the origins of the computer lie in a technical organization of labor that is related to the factory system and the concept of the division of (mental) labor. The second part of chapter two shows that this fact is not related to technological backwardness or something intimately related to industrial production (as the technicist view would have it), but that since it appears in the thought of Herbert Simon in his opposition to industrial democracy, there is a relation between a concept of the role of man in society, and the crafting of these technologies.









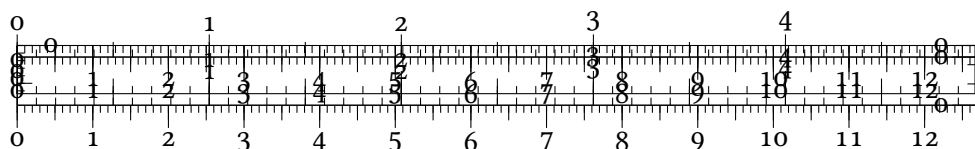
## THE TECHNICIST VIEW

*The first part of chapter one explains the technicist view by discussing Autor's article as an ideal type. This will be done by picking certain points from his argument and discussing them in depth. Briefly said, in this article, Autor tries to explain why if automation is supposed to "automate" so many jobs, why is it that there are still so many jobs. His answer is that while automation does substitute for labor, it also complements it by raising output in ways that demand greater labor, raise earnings and increase productivity. This is so because he believes that there are tasks that require flexibility, judgment, and common sense that are still too difficult to automate, thus jobs that require them will see their numbers increase. Autor does discuss the problem of polarization in the United States at the top and the bottom of the skill distribution: namely, the reduction in middle skill—skilled blue collar, clerical, and sales—and the increase in high skill—professional, managerial, technical—and low skill—low paid personal services—jobs.*

*He believes that for workers in the top of the skill distribution they can benefit from ICTs since they can be more productive due to complementarities with these technologies and benefit from multiple venues to employ their skills (i.e., elastic demand for services), and from their safety from competition due to high barriers to entry in relation to the many years of education required exercise their profession (i.e., inelastic labor supply). As for those at the bottom of the skill distribution, Autor claims that these jobs benefit little from advances in ICTs, their final demand is relatively inelastic, advances in productivity do ), and face competition due to low entry barriers (i.e., elastic labor supply) that temper their possible wage increases. That said, he claims that he does not believe that job polarization would translate in wage polarization, except in certain times and certain labor markets. [In this part, he cites several studies, but the problem is that they depend on the way the different jobs are categorized, and the comparability among different studies, due to precisely this same problem: data is not comparable (which he acknowledges). He does acknowledge that the quality of the jobs might be affected, but he does not explore the problem any further. He then discusses Polanyi's paradox and how machine learning might be able to circumvent it.*

## Introduction (What is the Technicist View?)

For the purposes of this thesis, the “technicist” view, is defined as the application of a realist epistemology to the question of the influence of au-





tomation on work. This view posits that work is a historical universal—work is, allegedly, common to all human societies—that automation facilitates. Therefore, this view understands the question from the angle of the technical possibilities to mechanize a task. Moreover, in this view, jobs are understood as simply collections of tasks. The argument goes, then, that if all the tasks in a job can be mechanized, automation would erase this job if the mechanization is cost-efficient for a firm. I contend that many mainstream economists and many computer scientists that discuss the problem of automation on the future of work, be they pessimist or optimistic of the prospects of ICTs, hold either this view or one that resembles it. Since MIT economist David Autor is one of the respected mainstream economists that has studied the longest the question of the consequences of automation, his paper “Why Are There Still So Many Jobs?” will be analyzed as an ideal type of the way mainstream economists tackle this question. His is a thoughtful exposition of a mildly optimistic pessimistic on the question, which will be analyzed in detail for the purpose of seeing the technicist view in action.

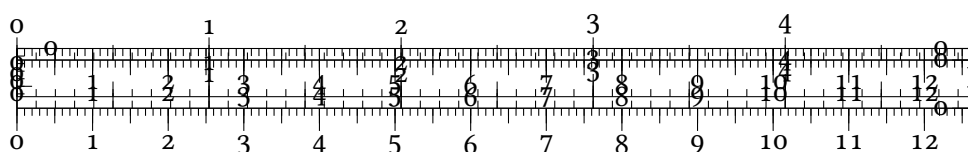
## What is Autor's Take

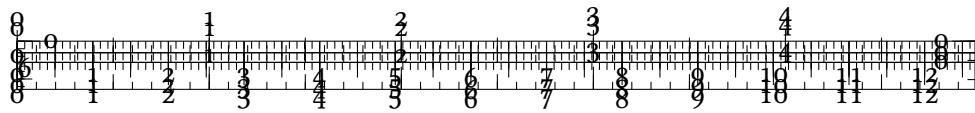
In this essay, I begin by identifying the reason that automation has not wiped out a majority of jobs over the decades and centuries. Automation does indeed substitute for labor—as it is typically intended to do. However, automation also complements labor, raises output in ways that lead to higher demand for labor, and interacts with adjustments in labor supply. Indeed, a key observation of the paper is that journalists and even expert commentators tend to overstate the extent of machine substitution for human labor and ignore the strong complementarities between automation and labor that increase productivity, raise earnings, and augment demand for labor.

Changes in technology do alter the types of jobs available and what those jobs pay. In the last few decades, one noticeable change has been “polarization” of the labor market, in which wage gains went disproportionately to those at the top and at the bottom of the income and skill distribution, not to those in the middle. I will offer some evidence on this phenomenon. However, I will also argue that this polarization is unlikely to continue very far into the foreseeable future. (Autor 2015, p. 5)

Autor begins his article by mentioning the usual introductory economics textbook example of the Luddites.

Autor asks, “Why doesn’t automation *necessarily* reduce aggregate employment, even as it demonstrably reduces labor requirements per unit





of output produced?”. Here, it is necessary to remember that Autor, as is customary within neoclassical economics, sees employment as depending on productivity and the “demand” of the labor market. His question reflects an understanding of employment as determined by these two factors. Hence, his perplexity could be framed as: If automation reduces the necessity to employ workers at certain tasks, why is it that we do not see a reduction of aggregate employment?

Autor begins by pointing out that in 1900, 41 percent of the US workforce was employed in agriculture; by 2000 that share had fallen to 2 percent (Autor 2014), mostly due to a wide range of technologies including automated machinery.

A final point, typically neglected in recent dismal prophecies of machine-human substitution, is that if human labor is indeed rendered superfluous by automation, then our chief economic problem will be one of distribution, not of scarcity. ...Here, I recall the observations of economist, computer scientist, and Nobel laureate Herbert Simon (1966), who wrote at the time of the automation anxiety of the 1960s: “Insofar as they are economic problems at all, the world’s problems in this generation and the next are problems of scarcity, not of intolerable abundance. The bogeyman of automation consumes worrying capacity that should be saved for real problems ...” A half century on, I believe the evidence favors Simon’s view. (Autor 2015, p. 26)

His position could thus be caricatured as that of the mocked book of Kenneth Rogoff, “nothing will change, but everything will change”.

### Role of automatic machinery

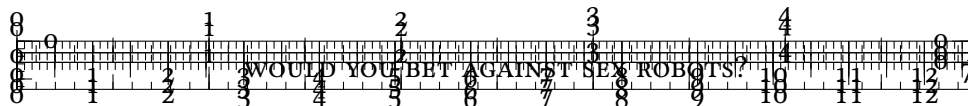
Whether the technology is tractors, assembly lines, or spreadsheets, the first-order goal is to substitute mechanical power for human musculature, machine consistency for human handiwork, and digital calculation for slow and error-prone “wetware.” (Autor 2015, p. 5)

He concedes that most workplace technologies are designed to save labor.

## Complementarities

I argue that the interplay between machine and human comparative advantage allows computers to substitute for workers in performing routine, codifiable tasks while amplifying the comparative advantage of workers in supplying problem-solving





skills, adaptability, and creativity. ...In many cases, machines both substitute for and complement human labor. Focusing only on what is lost misses a central economic mechanism by which automation affects the demand for labor: raising the value of the tasks that workers uniquely supply. (Autor 2015, p. 5)

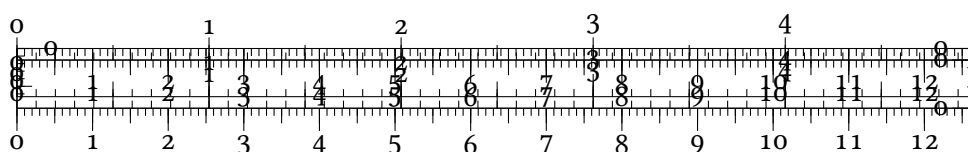
This makes sense in the economists world picture that although certainly very much changed, still retains a flavor of a mechanical systems of different forces balancing each other in equilibrium: when one thing changes, this change is balanced by adjustments in the systems that mitigate this change.

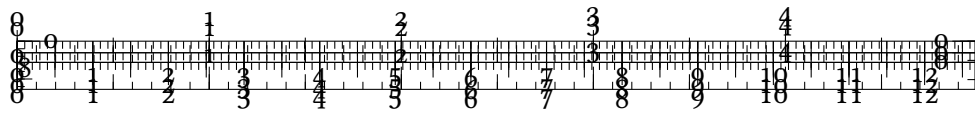
Indeed, a key observation of the paper is that journalists and even expert commentators tend to overstate the extent of machine substitution for human labor and ignore the strong complementarities between automation and labor that increase productivity, raise earnings, and augment demand for labor.

## The Two Sets of Tasks

...we distinguish two broad sets of tasks that have proven stubbornly challenging to computerize. One category includes tasks that require problem-solving capabilities, intuition, creativity, and persuasion. These tasks, which we term “abstract,” are characteristic of professional, technical, and managerial occupations. They employ workers with high levels of education and analytical capability, and they place a premium on inductive reasoning, communications ability, and expert mastery. The second broad category includes tasks requiring situational adaptability, visual and language recognition, and in-person interactions—which we call “manual” tasks. Manual tasks are characteristic of food preparation and serving jobs, cleaning and janitorial work, grounds cleaning and maintenance, in-person health assistance by home health aides, and numerous jobs in security and protective services. (Autor 2015, p. 9)

Stated plainly, the growth of occupational employment across skill levels looks U-shaped earlier in the period, with gains at low-skill and high-skill levels. By the 2000s, the pattern of occupational employment across skill levels began to resemble a downward ramp. In Autor (2015), I present a more detailed breakdown of these patterns, and in particular suggest that the set of abstract task-intensive jobs is not growing as rapidly as the potential supply of highly educated workers. (Autor 2015, p. 18)





Finally, here Autor discusses the international dimension of the changes in the US labor market. He mentions, among other things, the rise of China as a premier manufacturing exporter, and its consequences on US workers, reducing employment in directly import-competing US manufacturing industries and depressing labor demand in manufacturing and non-manufacturing sectors that served as upstream suppliers to these industries (i.e., their subsidiaries).

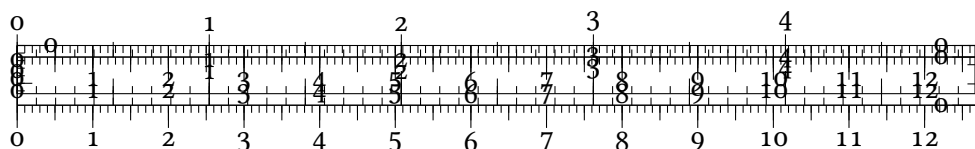
Of course, these forces are in various ways linked with the spread of automation and technology. Advances in information and communications technologies have changed job demands in US workplaces directly and also indirectly, by making it increasingly feasible and cost-effective for firms to source, monitor, and coordinate complex production processes at disparate locations worldwide and altering competitive conditions for US manufacturers and workers. This multidimensional complementarity among causal factors makes it both conceptually and empirically difficult to isolate the “pure” effect of any one factor. (Autor 2015, p. 18)

This essay has emphasized that jobs are made up of many tasks and that while automation and computerization can substitute for some of them, understanding the interaction between technology and employment requires thinking about more than just substitution. It requires thinking about the range of tasks involved in jobs, and how human labor can often complement new technology. It also requires thinking about price and income elasticities for different kinds of output, and about labor supply responses. (Autor 2015, p. 18)

## Polarization of the job Market

Changes in technology do alter the types of jobs available and what those jobs pay. In the last few decades, one noticeable change has been “polarization” of the labor market, in which wage gains went disproportionately to those at the top and at the bottom of the income and skill distribution, not to those in the middle. I will offer some evidence on this phenomenon. However, I will also argue that this polarization is unlikely to continue very far into the foreseeable future.

Autor claims that the elasticity of labor supply can mitigate wage gains. Namely, a flow of new workers can temper any wage gains that would emanate from complementarities between automation and human labor input.





Even if automation does not reduce the quantity of jobs, it may greatly affect the qualities of jobs available. (Autor 2015, p. 7)

Autor then discusses the phenomenon of “job polarization” (Goos and Manning, 2003) in which the simultaneous growth of high-education, high-wage jobs at one end and low-education, low-wage jobs at the other end occurs at the expense of middle-wage, middle education jobs. Autor believes this is the case since, following his characterization of tasks between *abstract* and *manual*, both are found at opposite ends of the skill spectrum—in professional, managerial, and technical occupations on the one hand, and in service and laborer occupations on the other.

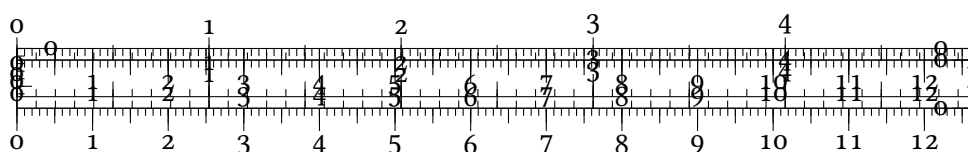
Labor supply to manual task-intensive occupations is intrinsically elastic, due to their generally low education and training requirements. This insight does not preclude the possibility that wages in manual tasks will rise, at least to some extent. As Baumol (1967) observed, even absent productivity growth in technologically lagging occupations, wages in these occupations must rise over time with societal income to compensate workers for not entering other sectors (again, assuming that demand for these activities is relatively inelastic). But it does suggest that wage increases in these jobs will be restrained to some extent by the labor supply response, including from workers displaced in other sectors of the economy.

This citation summarizes Autor’s thoughts on the effects of automation on manual task-intensive activities. Briefly, he believes that they are weakly complemented by computerization, difficult to outsource, and face an elastic labor supply that reduces their likelihood of wage increases due to increased demand. Autor claims that in a 2013 paper with Dorn, he presents evidence that wages for manual-tasks occupations rose during the 1990s when labor markets in the United States were extremely tight, but after 2000 wages fell with the expansion of manual task-intensive service occupations.

## Conclusion

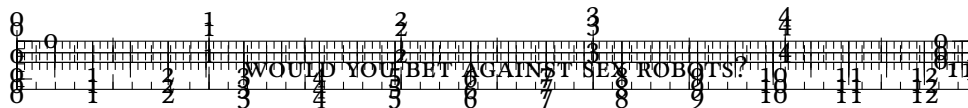
However, the limit of these studies is that they interpret the challenge of automation by artificial intelligence as simply that of estimating with a macroeconomic model the impacts of the substitution of capital for labor in employment rates, wages, etc. My position is that this way of framing and analysing the problem is not very interesting and offers very little insight on the wider issue of the changes portended by artificial intelligence.

My point of view is that many of the various analysis on this matter are marred by their narrow scope that only focuses on the possible impact of new technologies on what economists call macroeconomic variables. Briefly put, the views of neoclassical or mainstream economists, whether optimists or pessimists are decided on whatever the economist thinks that









## Historical Universals

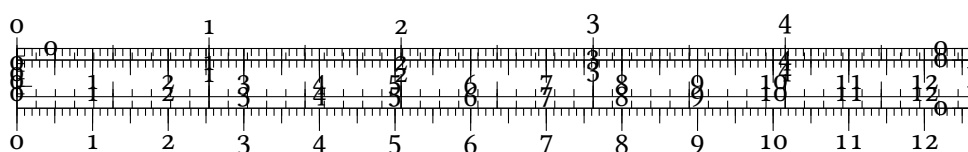
The problem with Autor's interpretation of what a job is, is that he basically thinks that a job is just a collection of tasks, so he is essentially leaving out the important part of the fact that a job is defined in Law and that it entails certain rights and responsibilities.

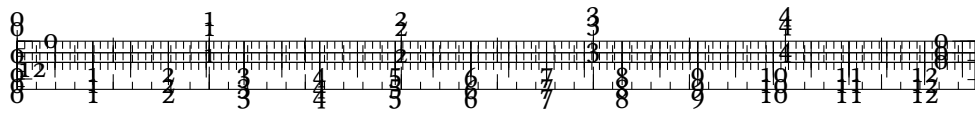
The article in the edited volume on Labor in the Ancient World by ?? poses the important question that is usually left out of today's writings on the so-called labor market: It is very hard to get people to work for one's account. The explication of why anybody would choose to work for others is usually "explained" by the division of labor and the mutually advantageous exchange, but the question is left out of why would anyone choose to do this, instead of provide it from the household economy.

As an example of this shortcoming, see how Autor claims that "the elasticity of labor supply can mitigate wage gains". But here we must wonder, why is it that there is any labor supply. This might seem a moot point or avoiding the question. But in fact, most contemporary analyzes of the "labor market" tend to assume the very difficult problem of how to get people to work for a wage. As studies of ancient Mesopotamia have shown, the problem for these ancient *economies* was not *unemployment* but lack of population to be employed (mostly by the palace and temples) to do all the tasks required. And, this was due to a social and institutional configuration in which most of the people, then peasants, were not alienated from their means of subsistence (specifically arable land), and thus, they kept not only a certain independence vis-à-vis public authorities, but also vis-à-vis other possible *employers*.

Nonetheless, another reason to employ humans is the fact that there *are* people to be employed. This might seem trivial, since economists, who like Autor, are in the business of producing models, tend to abstract from the social conditions of possibility. But this, I believe is a crucial thing to take into account in the evolution of work and employment. As studies of ancient Mesopotamia have shown, the problem for these *economies* was not *unemployment* but lack of population to be employed (mostly by the palace and temples) to do all the tasks. And, this was due to a social and institutional configuration in which most of the people, then peasants, were not alienated from their means of subsistence (specifically arable land), and thus, they kept not only a certain independence vis-à-vis public authorities, but also vis-à-vis other possible *employers*. That is to say, the vast majority of people, the peasantry, had very little need or incentive to work for others, when they could just work for themselves. This fact, is passes inadvertently in contemporary literature on the "labor market," which ignores that it is very hard to convince people to willingly work for one's own account.

The reason to bring this example up, is that the employment relation (or what French sociology of work has more accurately called the *salariat*)





depends on certain social and institutional conditions that analyzes such as Autor's assume will not change with the development of the ICTs.

One must explain the social conditions that make a majority of the population be willing to sell their labor in exchanges for wages, what in the french sociology of work (*sociologie du travail*) is called *le salariat* (i.e., the institution of wage earning). The *salariat* passes inadvertently in economic analysis of the job market, but I claim that one must understand the changes brought by automation not in terms of the relation of technology to concrete tasks, but rather in relation to the social conditions of salariat.

We must acknowledge that exchange is culturally situated, and that understanding the economic activity of exchange as a transhistoric phenomenon is a mistake.

As Alain Supiot has argued, the work contract, at least in the case of French Civil Law, has a history and its related to slavery.

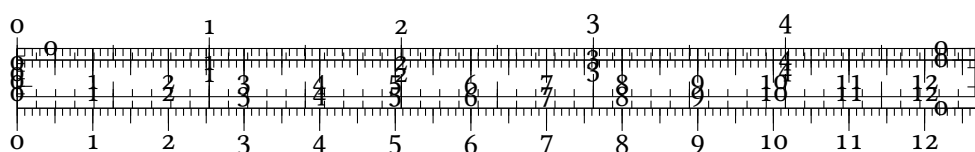
However, here we see one of the problems of the realist epistemology mentioned previously. After all, the job market is taken as a realistic entity, and its conventionalist character is not recognized. How technical changes affect employment will also depend on the conventions for employment and its legal regulations. As Schaffer (1994) points out, these conventions are not a side show, but a necessary prerequisite for technical change.

[The importance of the alienation of people from the means of subsistence, long ago noted by Marx (189X), is important even for the narrow aim of estimating the macroeconomic impact of automation in the labor market. The fact that workers in most of today's cities require a job to pay for the necessities of life, means that, unlike, say a semi-peasant household, today's workers will demand high wages, since they whole depend on them for their subsistence.]

## My Propositions

My claim is that his analyzes has two important shortcomings: First, the question that interests or worries computer scientists is not simply the effects of ICTs on the *rate* of unemployment. This question, which has been treated extensively, in my humble opinion, is not very interesting. I think that what computer scientists wonder about are the changes that these technologies will bring on work, and the employment relation. One measure of this, is the current historical meeting point between cryptocurrencies and anarchist politics. The potential that crypto-anarchists see, for example, in these technologies is the organization of economic activity that escapes subordination to the state, and thus guarantees more individual freedom.

My position in this thesis is that, just as Schaffer (1994) did for the analysis of automation in Victorian Great Britain, we should analyze the changes of automation not just as a question of changes in employment





but as a question of changes of labor, the nature of work, and the nature of the social organization of production.

The visibilization of the automatic machines of the factory rendered invisible the workers whose lives and bodies were reorganized around it.

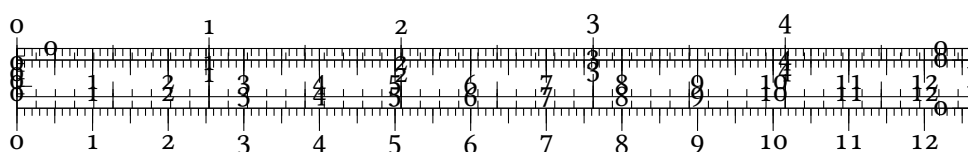
What is at stake here, I argue, is not whether machines will replace humans in every single task. Rather, the question that automation raises is that of the place of the human in the production and reproduction of society.

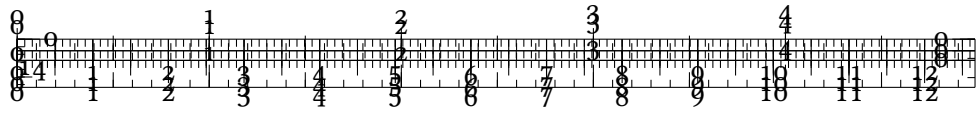
Notice that nowhere in the document does he discuss the worsening of working conditions due to technology. Notice how he mention “restaurant meals, cleaning services, haircare, and personal fitness” as sectors where since demand for them appears strongly income-elastic, rising productivity in technologically leading sectors may boost employment in these activities.

We need not worry, we can all work providing services for the rich. That’s the good life.

Author simply leaves aside the wider issues of the limit between nature and artifice, between man and machine.

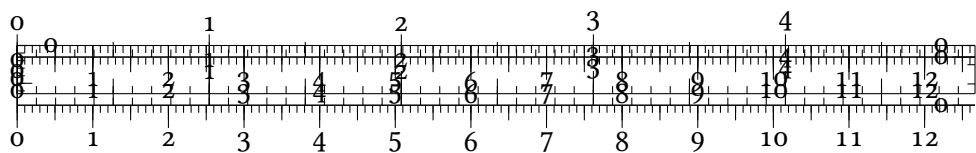
Just to clarify, I am not advocating a technological deterministic view of history here, but I am simply pointing out that these blue sky dreams of the promises of artificial intelligence are not simply connected to simple changes in automated tasks, but to the social and political possibilities opened up by these technologies. That is to say, although it is naive to believe that society will be turned upside down by artificial intelligence, it is equally naive to believe that social conditions of production will remain unchanged. Just to name one example, the fact that important numbers of today’s researchers on artificial intelligence are housed in private companies with a certain independence from government objectives also brings questions about the transformation of society brought on by the accumulation of power and the legitimacy to govern by those tech corporations, such as Google, Facebook, etc. As an honorable tradition in history of management theory has it, the exercise a authority within a firm has to be understood within the context of the political sovereignty exercised by the state. To think them separately, as is the case with certain strands of American political culture, subordination of workers to corporations and the consequences this has for the conduct of life and the loss of individual freedom is missed. One great change that goes unnoticed, due to the indue emphasis on the accumulation of financial resources by Silicon Valley, is the fact that these corporations are not just paying but also organizing the research on ICTs. If the shifting of power in the corporation out of corporate boards to other concerned parties such as workers, consumers, citizens, etc. For as Mirowski (2011) claims, there has been a very big change in the social organization of American science since the end of the second world war, passing from a state-led to a private firms-led model of funding and organization of science. And, if there is one area where this is most

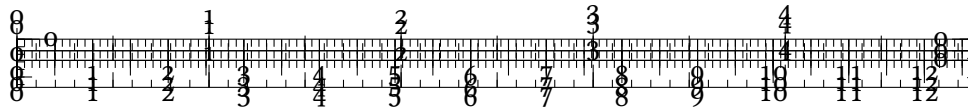




obvious is in artificial intelligence, where big tech giants such as Google and Facebook are responsible for directing some of the most important research projects in this domain.

If artificial intelligence brings about any meaningful changes, my point of view is, this will not depend on the particular tasks that it helps automate, such as the discussion is today with self-driving cars, but rather on the changes in the social conditions of production that these changes might bring.





### 3



## Did Adam Smith Invent the Digital Computer?

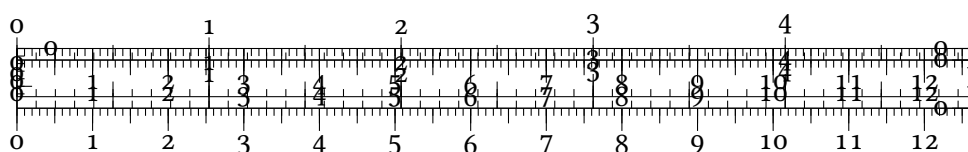
*In the second chapter, I should sketch a different view (to the dominant technicist one) by explaining how thoughts on machine intelligence, automation, and sociotechnical systems for the conduct of workers have been connected since at least the nineteenth century.*

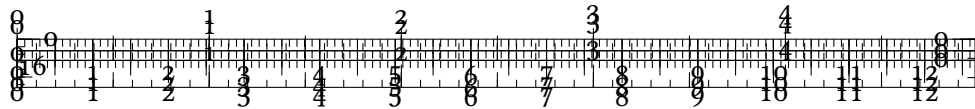
Nor was the intellectual significance of Babbage's computer understood until the soul found its body a century later. In the absence of a practical realization, the computer did not attract enough attention of sharp minds to reveal its real significance. Even Babbage did not envision his computer as equipotential with the human mind. He did not see that the powers with which he had endowed it in order to enable it to make general arithmetic calculations are the powers the human mind uses in order to think and to understand language. (Simon, 1973, *The Next Hundred Years: Engineering Design*)

### INTRODUCTION

As you will see, this story shows that physicists and electrical engineers had little to do with the invention of the digital computer—that the real inventor was the economist Adam Smith, whose idea was translated into hardware through successive stages of development by two mathematicians, Prony and Babbage. (Simon and Newell 1958, p. 2)

On November 14, 1957, in an address to the Twelfth National Meeting of the Operations Research Society of America, Herbert Simon advanced the





provocative proposition that “physicists and electrical engineers had little to do with the invention of the digital computer”, for “the real inventor was the economist Adam Smith, whose idea was translated into hardware through successive stage of development by two mathematicians, Prony and Babbage.” Simon and Newell 1958.

## MANUFACTURING LOGARITHMS AND WEAVING ALGEBRAICAL PATTERNS

*The first part of chapter two shows that the concept of the division of (mental) labor lies at the origin of the computer. Therefore, I describe de Prony’s project and Babbage’s inspiration from it to devise his calculating engines. The idea is to emphasize that Babbage believed that the project was the proof that mental labor could be divided as mechanical labor, and that he came to believe that the laws of the mind were also mechanistic (his engine was an analogy of the world at large). The mechanization of mental labor had portentous consequences for the history of intelligence and the history of economics.*

### Introduction

The division of labor as embodied in the allocation of tasks in de Prony’s project shows, the first large *computing* project was not only a project that showed the efficiency of the distribution of mental labor, but a new form of subordination of the mind to a particular organization of mental work in which workers were not only deprived of control but of full knowledge over the productive process.

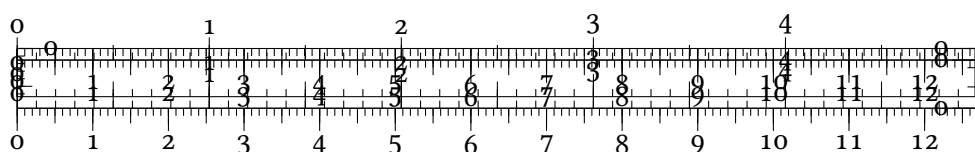
Remember to describe what de Prony’s project was about

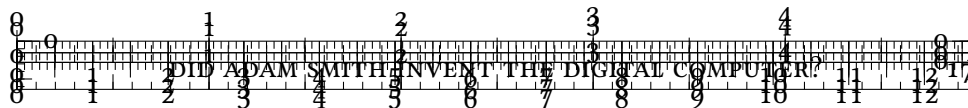
### The Division of Labor as the Foundational Concept of the Computer

#### *Background on the Tables Project*

En 1790, l’Assemblée nationale décida de remplacer les anciens impôts par une contribution foncière assise sur le revenu net des propriétés (6). Elle suivait en cela les idées de l’économiste François Quesnay. Créé en 1791, le Bureau du Cadastre avec la mission précise de faire établir ces cadastres parcellaires dans chacune des communes françaises.<sup>1</sup> In connection with

1. Durant onze années, le Cadastre a réalisé deux sortes de travaux : des cartes et des tables. Nous montrerons ci-après comment ces tâches se sont substituées à l’objectif initial





this plan, it was decided that a very large set of logarithmic and trigonometric tables would be prepared to supplement the metric system (which had been inaugurated as nature's own measure, eternal and immutable).

With the adoption of the decimal-based metric system, the Revolutionary government rendered all older trigonometric tables computed using traditional sexagesimal divisions of the circle suddenly unusable, at least for French geodesists and astronomers bound to the new system. Although originally commissioned as part of the Cadastre of France, launched in 1791, with Prony as director, the logarithmic tables having been expressly designed for the decimal division of the angles of the quadrant, which, along with the decimal division of time was later abandoned as part of the metric system.

### *Prony's Atelier*

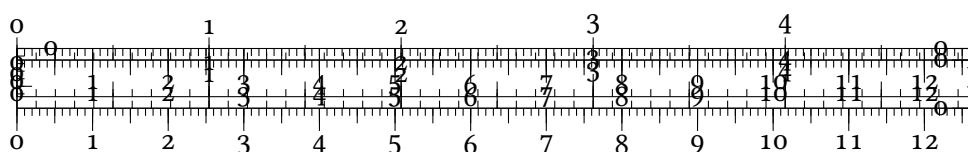
Prony gave some details of the project in a 'Notice' read to the classe des sciences mathématiques et physiques in 1801, soon after it was finished.

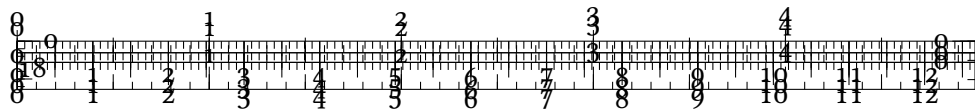
The personnel were divided into three sections according to the work they did.

At the apex, in the first section contained a handful of mathematicians, including A. M. Legendre, C. A. Prieur de la Cote d'Or, and Lazare Carnot. They chose the mathematical formulae to be used for calculation and checking, and also considered the choice of initial values of the numbers or angles, the number of decimal places to be adopted in each table, and so on. Below them, in the second section comprised several 'Calculators', including the mathematicians A. M. Parseval (of the well-known formula in infinite series) and the textbook writer J. G. Gamier, who determined the values, and the differences of various orders, that needed to be calculated. They also prepared a page of tables for the numerical work by laying out the columns of the chosen values and the first row of entries, and preparing the instructions on the preparation of the remaining entries on the page. At the base, in the third section, these calculations were done by the third section, a large team of between 60 and 80 assistants.<sup>2</sup> Many of these workers were unemployed hairdressers; one of the most hated symbols of the ancien regime had been the hair-styles of the aristocracy, and the obligatory reduction of coiffure 'as the geometers say, to its most simplest expression'

qui était de nature fiscale : établir la répartition de la contribution foncière (Peaucelle 2012).

2. My presentation of the Project draws from that of Grattan-Guinness (2003). Roegel (2011), who has closely studied the lists of the employees at the Cadastre, disagrees with Grattan-Guinness's emphasizing of the employment of hairdressers as calculators because he suspects that "there were only two or three of them" (Roegel 2011, p. 26). Nonetheless, Roegel points out that the first mention of the anecdote seems to be an 11<sup>th</sup> November 1824 discourse by engineer Charles Dupin–Prony's close friend— from which Grattan-Guinness drew upon (Dupin 1824).





left the hairdressing trade in a severe state of recession. Thus these artists were converted into elementary arithmeticians, executing only additions and subtractions.

knowing only the rudiments of arithmetic who would perform millions of additions and subtractions and enter the values by hand into ruled folio volumes specially laid out for the purpose. By means of these “manufacturing” methods, as Prony later called them, two copies of the tables, each consisting of seventeen manuscript volumes plus instructions, were completed by 1801.

### *Work and Calculation*

Si la démarche de Prony demeure isolée, dans un contexte de production encore largement traditionnel, elle marque tout de même l’ouverture d’un nouveau front. L’organisation du travail devient raient une affaire d’ingénieur, même si le cahntier ne suit pas le mouvement, et si l’industrialisation se fait encore attendre.

Les tables du Cadastre prennent une connotation tout aussi politique que scientifique. Les méthodes employées pour venir à bout de cette tâche gigantesque traduisent qant à elles des enejxy de rationalisation sociale. Concrètement, cette divsion du travail se manifeste par une organisation hiérarchique des compétences.

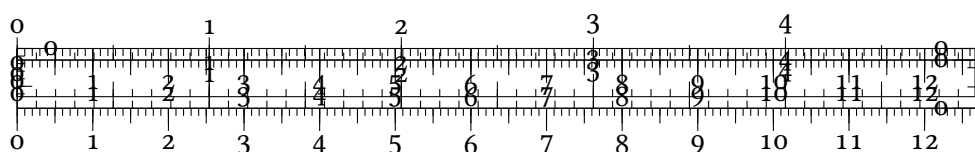
Work and mechanical were closely linked in both French and English usage until the middle decades of the nineteenth century, and the middle term that joined them was the laboring body. Work taxed the body but not the mind; even the most deft manipulations of “rude mechanicals” were ascribed to habit and instinct rather than thought.

Calculation had not yet become mechanical, the paradigmatic example of precesses that were mental but not intelligent. Allied with the higher mental faculties of speculative reason and moral judgment, calculation was remote from the realm of menial labor, of the automatic and the habitual.

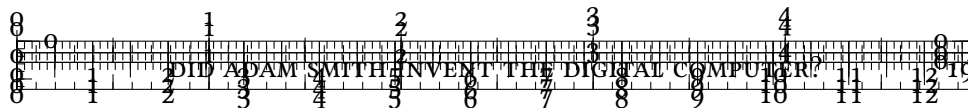
Astonishing feats of mental arithmetic were soon to beocme the province of the idiot savant and the sideshow attraction, no longer the first augury of profound mathematical gifts

Calculation took on the dull, patient associatoin of repetitive and ill-paid bodily labor, ranked as the lowest of the mental faculties.

In so doing, it pushed calculation away from intelligence and towards work.







## The Ghost in Babbage's Engines

### *Cogwheel Brain*

They all form instantiations of Lord kelvin's dictum (Thomson [1884] 1987, 111, also 296) that we can only understand something if we can make a mechanical model of it. Babbage's Difference Engines and the new formal logic developed by Boole, De Morgan, and Jevons were driving forces in the development of mechanical reasoning in all these senses.

Halfway through the nineteenth century, the categorical distinction between the phenomena of mind and matter vanished under the influence of developments within psychophysiology. This enabled economists such as Jevons to transgress the boundaries traditionally set to the tools of the natural sciences might be used to disclose the laws of the mind.

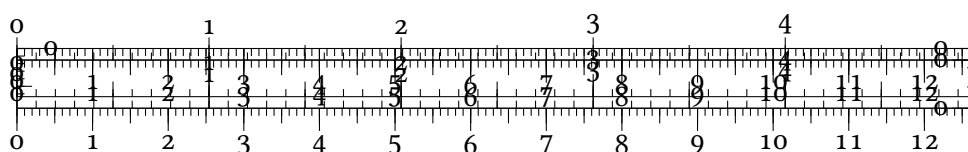
### *Babbage Reads Prony*

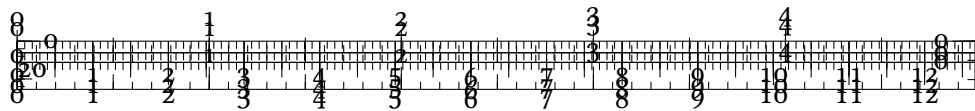
Babbage's calculating engines project emerged out of a growing need for precise and accurate tables by the quickly industrializing British economy. These tables were necessary, among other things, for navigation and for insurance companies that were rapidly growing in importance.

There were so many faults that could be made in the production of numerical tables, in the computations of the "avalanche of numbers" comprised in them, in the copying of the outcomes, and in the various stages of the printing process that Herschel and Babbage spent many hours checking these tables themselves for their own scientific purposes. One one such occasion, as the story goes, Babbage exclaimed in exasperation that the wished these computations had been made by "steam" (see for example, Swade 2000, 15).

Indeed, soon afterwards, in a pamphlet of 1822 on 'the application of machinery to the purpose of calculating and printing mathematical tables'—his main publication for securing governmental support for production of the Difference Engine—he gave some account of de Prony's project and noted that mechanical methods would speed up the process of calculation. Clearly he was struck by de Prony's production of the tables following an industrial process, and was hoping to imitate the process by mechanical means. In his book on manufactures, he rehearsed some of the same material on de Prony's project and on mechanical calculation.

In other cases, mechanical devices have substituted machines for simpler tools or for bodily labour. The artist has been furnished with command of power beyond human strength, joined with precision surpassing any ordinary attainment of dexterity. He is enabled to perform singly the work of a multitude, with the accuracy of a select few, by mechanism which takes the



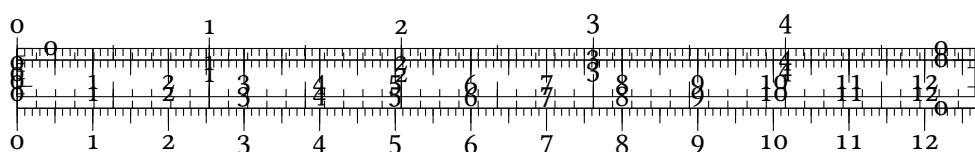


place of manual labour or assists its efforts. But the invention, to which I am adverting, comes in place of mental exertion: it substitutes mechanical performance for an intellectual process: and that performance is effected with celerity and exactness unattainable in ordinary methods, even by incessant practice and undiverted attention. (Colebrooke 1823, p. 223)

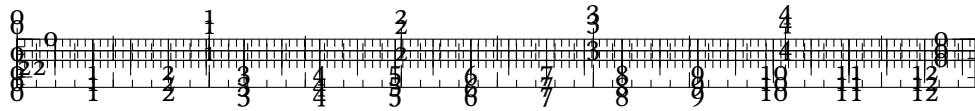
Prony's approach showed Babbage that it was possible to mechanize not only physical, but also mental, labor. His interest in the French project fits into his wider perception of algorithmic procedures in "mathematics, science, and other walks of life" (Grattan-Guinness 1992, 34). Babbage emphasized in *Machinery and Manufactures* ([1835] 1963), still one of the most fascinating studies on the emerging mechanization of the economy, that the lowest task of Prony's project was "almost" a form of mechanized mental labor. Babbage designed his Difference Engine to mechanize this lowest stage of computing. Its method of computation ingeniously incorporated the method of differences in its wheels and gears, hence its name. Babbage's Difference Engine promised to fulfill all requirements Herschel and Babbage had been lamenting about: It saved calculation time and produced accurate and precise numbers. The computations would be more accurate than when done by a human individual—for machines, as opposed to humans, were thought not to make unpredictable mistakes. An attached printer would prevent errors in transcribing the outcomes. By thus excluding human interference from the whole process of computing and printing, all sources of faults—human faults—would be prevented, and the numbers would be precise, accurate, reliable, and reproducible. All this, of course, was based on the assumption that the machine itself operated flawlessly, a matter of great concern to Babbage. For all his calculating engines, he designed automatic checks and stops to secure its proper working.

Prony's approach affected the traditional view of the hierarchy of mental and physical labor. Before Prony started his table project, computations were, for the most part, made by mathematicians themselves for their own purposes (Warwick 1995, 317–8). The routinisation and then mechanization of computing downgraded calculation to the lowest of mental activities, thus equating it with the routine labor executed in the emerging factories. Babbage exploited the comparison of calculation with routine factory labor in straightforwardly paralleling Prony's division of tasks with the division of tasks necessary for the construction of a "cotton or silk-mill". The "multitude of other persons" (the calculators or their mechanical equivalent) used in their employment the "lower degree of skill" (Hyman 1989, 143).

Babbage, writing of the project in 1832, was still obliged to admit that his claim "that the division of labor can be applied with equal success to mental operations" would "appear paradoxical to some of our readers." The







the operations of matter and the abstract mental processes of the most abstract branch of mathematical science.” (Lovelace, 25)

Babbage’s severe blow to traditional categories of natural theology and moral philosophy was only convincing, however, on the assumption that the caprices of his calculating engines served as analogies to the world at large, the natural and the moral, which is more or less a definition of mechanical reasoning: to understand the world by means of machines. (Maas)

2019/04/24

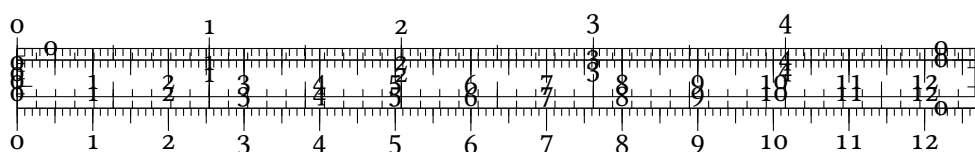
This is key in the discourse on the upcoming changes of artificial intelligence in the workplace. Automation renders invisible the labor, the people who have to work to device these systems.

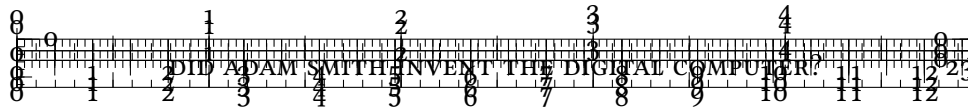
Another of the uses which the slightest attention to the details of this notation irresistibly forces upon our notice, is to exhibit, in the form of a connected plan or map, the organization of an extensive factory, or any great public institution, in which a vast number of individuals are employed, and their duties regulated (as they generally are or ought to be) by a consistent and well-digested system. The mechanical notation is admirably adapted, not only to express such an organized connection of human agents, but even to suggest the improvements of which such organization is susceptible—to betray its weak and defective points, and to disclose, at a glance, the origin of any fault which may, from time to time, be observed in the working of the system. (Lardner in the Edinburgh Review in H. P. Babbage 2010, p. 78)

The replacement of individual human intelligence by machine intelligence was as apparent in the workshop as in the engines. This task was both *politically* and *economically* necessary.

One of the most singular advantages we derive from machinery is in the check which it affords against the inattention, the idleness, or the knavery, of human agents. (C. Babbage 2009, p. 39)

What happened in the reorganization of production in the system of production of pulley blocks for the Royal Navy between 1795 and 1807 was that machinery wasn’t there just to make the process more productive. Machinery was there to set the standard of what the ideal behavior of the workforce should be: obedient, fast, coordinated, etc. Machines were not replacements of workers as much as they were idealized version of the





working body. Machines were organized as an idealized workforce under the gaze of the sociotechnical manager: Taylorism *avant la lettre*. Later, once the application of machinery was thorough, and workers were required to *adapt* to new working conditions, they weren't passively adapting to an innocuous technical change; they were conforming to idealized versions of themselves.

...economic rationality fought with traditional forms of exchange, or, following Michel Foucault, with Benthamite strategies for the surveillance of the body in the illuminated spaces of the Panopticon. Babbage's campaigns for machine intelligence take their place alongside these more familiar strategies for the reconfiguration of the productive body. (Schaffer 1994, p. 214)

## Conclusion

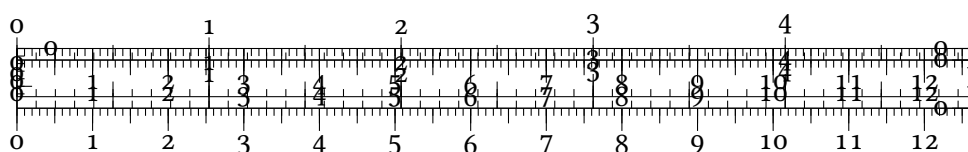
### THE IMPOSSIBILITY OF A DEMOCRATIC COMPUTER

*The second part of chapter two discusses Herbert Simon's article What is Industrial Democracy in relation with his thinking about the nature of hierarchical systems. I should use the articles on Functional Analysis and Organizations to show his understanding of general systems. The problem is that Simon thought that organizing a society was akin to building a computer program. I should discuss the dangers of his erasing the limit between nature and artifice, for, in the case of the work contract, the relations of subordination it implies are then naturalized.*

*So the problem, is that by using Simon's framework to understand sociotechnical systems, we are naturalizing subordination. Therefore, while I cannot pronounce on the application for technical problems, I would argue that this can only be thought as exclusively technical problems in the context of his thinking about the goals of organizations.*

*It should be noted that the notion of program, actually predate computer programs, and in the case of Simon, it was first used in the context of his thinking about organizations.*

The second part of chapter two shows that this fact is not related to technological backwardness or something intimately related to industrial production (as the technicist view would have it), but that since it appears in the thought of Herbert Simon in his opposition to industrial democracy, there is a relation between a concept of the role of man in society, and the crafting of these technologies.







Functional analysis consists, then, in a correlation between the processes and mechanisms that are operable in a system and the totality of conditions that is sufficient for the maintenance of the invariance of the relations that define the system. At the grossest level of analysis, we analyze “survival” into its component relations; at finer stages of analysis, we analyze these components into systems of mechanisms, and into the elements of these systems. (Simon 1954, p. 6)

In Simon's picture of homo administrativus man is nothing by himself, but only in relation to an organization.

To Simon, organizations were vast decision-making machines specialized vertically into hierarchies in order to coordinate the successive elaboration of decision premises down to the level where specific action can be taken. For Simon, the constraints which organizations posed upon rationality were not “iron cages” of bureaucratic domination, but rather what made rationality possible.

## Bounded Rationality Summons Hierarchy

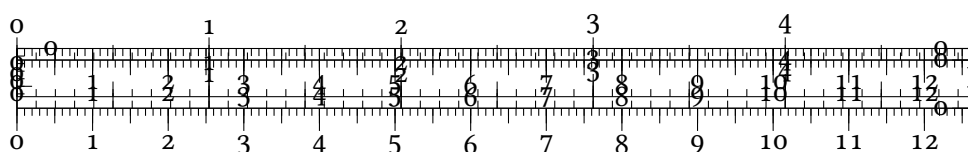
*Here I discuss the political implications of the concept of bounded rationality, for I contend that*

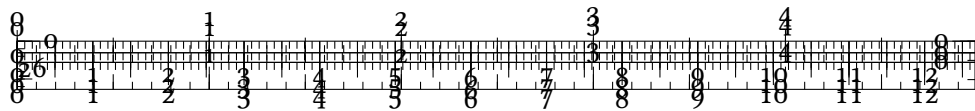
*I discuss the anti-democratic consequences of Simon's notion of bounded rationality. The claim is that although Simon himself wasn't personally in favor of authoritarian government, there important anti-democratic implications in terms of workplace democracy*

*Since the New Deal, thinking of workplace democracy has given place to discussion on living standards with the understanding that people give up their claim on control over the work process in exchange for rising living standards. Today with the floundering of the wage relation (salariat), the new proletariat has*

Instead of *homo œconomicus*, Simon's model of man was *homo adaptivus*: the adaptive, problem-solving organism of finite powers that moved in an infinitely complex hierarchically organized environment.

“Design” offers a solution of how it is done the brain, of how the system, started at any random state, can *automatically* improve its ways of working, improving in ways that are far beyond the comprehension of the units that compose it. It ought, therefore, to be possible, by using the same principle to get a society organised so that it too starts *automatically* to improve its ways of behaving, improving them by reactions that are too clever to be understood by the people that compose it. (Ashby 1953, pp. 1–2)





It is impossible for the behavior of a single, isolated individual to reach any high degree of rationality. The number of alternatives he must explore is so great, the information he would need to evaluate them so vast that even an approximation is hard to conceive. Individual choice takes place in an environment of “givens”—premises that are accepted by the subject as bases for his choice; and behavior is adaptive only within the limits set by these “givens.” (Simon 1997, p. 92)

Prony himself remarked upon the social oddity represented by “the quite singular gathering of men who had had such different existences in the world” and upon the intellectual anomaly that the fewest computational errors were made by those “who had the most limited intelligence, an automatic existence, so to speak”. (Daston 1994, p. 195)

...ils ont ete communement au nombre d'environ soixante ou quatre-vingts ; les neuf dixiemes au moins d'entre eux savoient tout au plus les deux ou les quatre premieres regles de l'arithmetique, et ceux qui en savoient davantage n'ont pas toujours ete les moins sujets a erreur. (Riche de Prony 1804, p. 53)

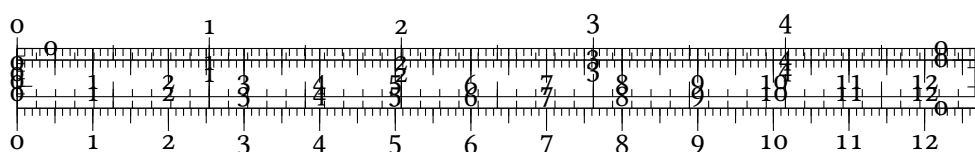
Calculation had up to that point been an intellectual occupation fit for the finest minds and the best society.

The rational individual is, and must be, an organized and institutionalized individual. (Simon cited in Simon 1997, p. 46)

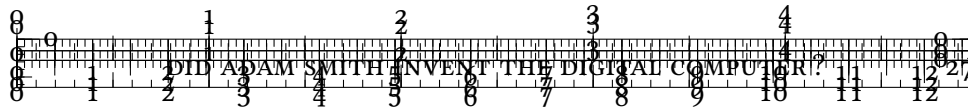
Human rationality operates, then, within the limits of a psychological environment. This environment imposes on the individual as “givens” a selection of factors upon which he must base his decisions. (Simon 1997, p. 117)

At this point in my research, I can at most suggest a connection, but given Simon's thinking in organizations, it would be useful to read together his technical work on computing in the light of his work on organizations (as has been suggested by Heyck 2005).

One function that organization performs is to place the organization members in a psychological environment that will adapt their decisions to the organization objectives, and will provide them with the information needed to make these decisions correctly. (Simon 1997, p. 92)







We have authority in organizations, based on the employment relation between employee and employer, because it provides a very effective way of organizing human efforts under conditions of uncertainty—under conditions where coordinated action is needed, but where it is not known today in detail what actions will be needed tomorrow. The employment relation permits effective, coordinated action to be carried out by organizations under such conditions of uncertainty. And the employment relation is the primary source of authority in organizations in our society. (Simon 1983, p. 36)

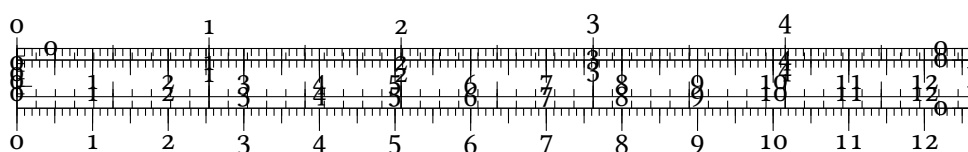
However, here we should note something, one of the pioneers of artificial intelligence Simon 1983, agreed with worker subordination, as he argued that workers should submit to the organizational hierarchy. As Simon defended his attack on industrial democracy : “Employees who are informed and consulted can usually be expected to work more effectively and with more enthusiasm than those who are not, and to contribute important elements of expertness out the decision-making process. I suppose that even the conductor of the symphony orchestra asks the concertmaster for suggestions during rehearsals—or if he does not, might improve the orchestra’s quality by doing so. But that is a very different matter from organizing the orchestra as a voting body with the members holding formal rights to participate in most of the management decisions”.

Simon continues : “We must learn that democracy and politics are all part of the same package of imperfect human institutions, constructed of imperfect human beings. We want to have democratic institutions, and the price we pay for them is to put up with the political process, There seems to be no institutional design that gives us the benefits of the one without the costs of the other.”

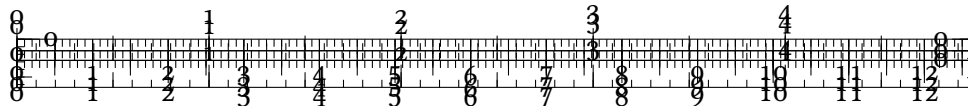
Simon’s explanation of the necessity of authority within the employment relation due to the existence of uncertainty is a dangerous naturalization of hierarchy as simply a necessary consequence of the complexity of the environment and our bounded rationality which makes us unable to fully grasp it.

## Conclusion

## CONCLUSION







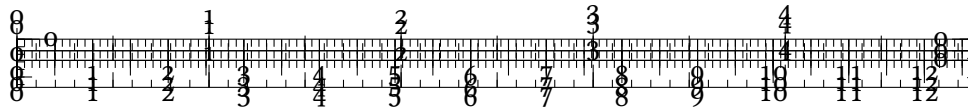
4



## Conclusion

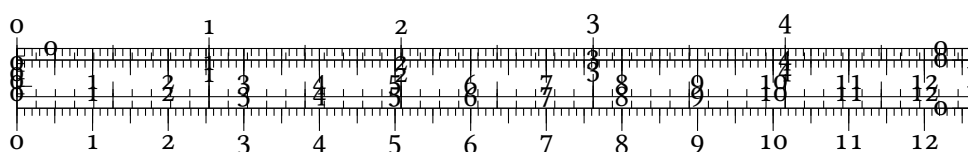


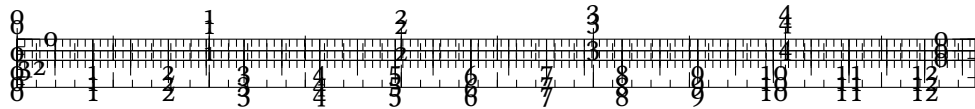




## References

- Ashby, William Ross (June 23, 1953). *Letter to Herbert Alexander Simon*. Box : 91, folder : 7434, HSCM.
- Autor, David (2015). “Why Are There Still So Many Jobs ? : The History and Future of Workplace Automation”. In : *Journal of Economic Perspectives* 29.3 (Summer), pp. 3–30.
- Babbage, Charles [1832] (2009). *On the Economy of Machinery and Manufactures*. Cambridge Library Collection. New York : Cambridge University Press.
- Babbage, Henry Prevost, ed. [1889] (2010). *Babbage’s Calculating Engines : Being a Collection of Papers Relating to Them ; Their History, and Construction*. Cambridge Library Collection. Cambridge, New York : Cambridge University Press.
- Colebrooke, Henry Thomas [1889] (July 13, 1823). “Address of Henry Thomas Colebrooke : On Presenting the Gold Medal to Charles Babbage”. In : *Babbage’s Calculating Engines : Being a Collection of Papers Relating to Them ; Their History, and Construction*. Ed. by Henry Prevost Babbage. Cambridge Library Collection. Cambridge, New York : Cambridge University Press, pp. 223–224.
- Daston, Lorraine (1994). “Enlightenment Calculations”. In : *Critical Inquiry* 21.1, pp. 182–202.
- Dupin, Charles (1824). “Discours d’ouverture d’un cours de mécanique appliquée aux arts, prononcé par M. Charles Dupin, le 11 novembre 1824”. French. In : *Annales de l’industrie nationale et étrangère, ou Mercure technologique : Recueil de mémoires sur les arts et métiers, les manufactures, le commerce, l’industrie, l’agriculture, les hôpitaux, etc.* Ed. by Louis-Sébastien Le Normand and Jean-Gabriel-Victor de Moléon. Vol. 16. Paris : Bachelier, pp. 193–216. BNF : NUMP-9292.
- Grattan-Guinness, Ivor Owen (2003). “The Computation Factory : De Prony’s Project for Making Tables in the 1790s”. In : *The History of Mathematical Tables : From Sumer to Spreadsheets*. Ed. by Martin Campbell-Kelly et al. Oxford : Oxford University Press. Chap. 4, pp. 105–122.
- Mirowski, Philip (2011). *Science-Mart : Privatizing American Science*. Cambridge, London : Harvard University Press.
- Peaucelle, Jean-Louis (2012). “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, pp. 74–86.

Riche de Prony, Gaspard-Clair-François-Marie (1804). “Notice sur les grandes tables logarithmiques et trigonométriques, calculées au bureau du cadastre sous la direction du citoyen Prony : lu le premier germinal an 9”. French. In : *Mémoires de l’Institut national des sciences et arts : Sciences mathématiques et physiques*. Ed. by Institut de France. Vol. 5. Paris : Baudouin, pp. 49–55. BNF : 4-H-8248 (5).

Roegel, Denis (2011). *The Great Logarithmic and Trigonometric Tables of the French Cadastre : A Preliminary Investigation*. French. Nancy : Laboratoire lorrain de recherche en informatique et ses applications.

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

Simon, Herbert (1951). “A Formal Theory of the Employment Relation”. In : *Econometrica* 19.3, pp. 293–305.

– (Apr. 1, 1954). “Functional Analysis and Organization Theory I”. Working Paper. Box : 42, folder : 3288, HSCM.

– (1983). “What is Industrial Democracy ?” In : *Challenge* (January-February) pp. 30–39.

– [1945] (1997). *Administrative Behavior : A Study of Decision-Making Processes in Administrative Organizations*. 4th ed. The Free Press.

Simon, Herbert and Allen Newell (1958). “Heuristic Problem Solving : The Next Advance in Operations Research”. In : *Operations Research* 6.1, pp. 1–10.

Sismondi, Jean Charles Léonard de (1819). *Nouveaux principes d’économie politique : ou de la Richesse dans ses rapports avec la population*. French. Vol. 2. Paris : Delaunay. BNF : NUMM-95554.

