

SÉRGIO
FERRO
Concrete as
Weapon

*With an introduction by
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INTRODUCTION

— How to Look at Architecture from “Below”

Kunstgeschichte—the discipline of art history, first established in German-speaking universities in the 19th century—consolidated an assumption that continues to influence our view of architecture and its history: that stylistic changes ultimately spring from a changing collective spirit, a *Zeitgeist*, impelled to express itself in every medium, including buildings. This spirit supposedly moves on from one style to the next through inner evolution or conflict, while assimilating technical novelties or functional demands only indirectly, mediated by higher logics of form. The power of this view for art history was inherited from Georg Wilhelm Friedrich Hegel, who had explained social totality precisely through the dialectical progress of the (collective) consciousness, or “the spirit.”¹

Karl Marx’s proposition was to retain Hegel’s method—dialectics—without keeping its mystifying features: “With him [Hegel] it is standing on its head. It must be turned right side up again, if you would discover the rational kernel within the mystical shell.”² For Marx, the Archimedean point from which to understand social totality should not be the spirit, but the material world and its transformation by human labor. But Marx’s critique of political economy has had little influence on architectural historiography.

1 Georg Wilhelm Friedrich Hegel, *Aesthetics: Lectures on Fine Art*, trans. T. M. Knox (Oxford: Oxford University Press, 2001).

2 Karl Marx, preface to the second edition of *Capital*, trans. Ben Fowkes (London: Penguin Classics, 1990), 1:103.

Sérgio Ferro's approach to architecture, first proposed in the 1960s, is nothing less than an analogical demystification. In a powerful corpus of theoretical and historical studies, Ferro has continued to develop a perspective that turns architectural thinking right side up again, to "discover the rational kernel within the mystical shell." The mystical shell, in this case, is the discipline's upholding of a notion of architectural design as a (relatively) autonomous field, whose role in the real world lies mainly in the *reception* of its built products, and not in their material production. And the rational kernel is this very production, which is too often sidelined by architects as the "construction industry" and despised as irrelevant for the higher aspirations of architecture "proper." Delving far beyond pragmatic and designerly debates about technical and aesthetic solutions, or the protests we are witnessing against unjust labor conditions on the construction site and in the profession, Ferro's critical theory of architecture seeks to understand how architectural praxis and discourse fit into the logic of building production under capital. He argues: "architects, whatever their intentions and when acting within the profession's usual terms, are courtiers of capital."³ In contrast, architecture as a process and product of free work, individually and collectively self-determined, and without the social division between material and mental labor, could be "the greatest of the arts."⁴

Ferro's inquiry entails modes of historical research that focus on labor in the production of architecture; consider all of its forms, divisions, and conditions; articulate long-term analyses while at the same time paying attention to particular circumstances. Such an approach reveals determining factors and processes that tend to go unnoticed in conventional historiography but, once made explicit, acquire a remarkable explanatory power. The history of architecture—including building practice and design—suddenly appears to be part of a wider history of social struggle with intricate processes of subordination and differentiation, deskilling and ennoblement. Changes in architectural style, discourse, and technique are understood not as expressions of a mystically evolving spirit; rather they come into sight as products and agents of the conflicting interests of production. Ferro proposes, for instance, a genealogy of the modern profession that goes back to the 9th century, the construction of cathedrals as part of "primitive accumulation," and the *parliers* who first negotiated contracts and then began to establish their terms by writing and drawing.⁵ He also examines painting, drawing, engraving, and sculpture, from Albrecht Dürer to Diego Velázquez, in the face of an increasing social devaluation of manual labor and attempts to ennoble or transcend it within the artistic realm.⁶ And to cite a final

3 Sérgio Ferro, "Dessin/Chantier: An Introduction," in *Industries of Architecture*, eds. Katie Lloyd Thomas, Tilo Amhoff, and Nick Beech (London: Routledge, 2016), 101. In his introduction to Ferro's text, Felipe Contier explains that the use of the slash in the formulation of "Dessin/Chantier" indicates that architecture places the building site "below" design. Felipe Contier, "An Introduction to Sérgio Ferro," in *Industries of Architecture*, 87–93.

4 Sérgio Ferro, "Poderia ser a maior das artes: entrevista a Simone Sayegh," *Revista Arquitetura e Urbanismo* 123 (2004): 70. All translations our own unless otherwise noted.

5 Sérgio Ferro, *A história da arquitetura vista do canteiro: três aulas* (São Paulo: GFAU, 2010), 13–30.

6 Sérgio Ferro, *Artes plásticas e trabalho livre: De Dürer a Velázquez* (São Paulo: Editora 34, 2015).

example from his many texts, he carefully collects the traces of Michelangelo's practice, contrasting his *modus operandi* as an artist to his *modus operandi* as an architect.⁷

"Concrete as Weapon" demonstrates the fertility of this perspective and approach for architectural history. Originally written in 1980, it is published here for the first time in English, substantially revised and expanded. As Felipe Contier points out in his introduction to the only other text by Ferro that has been translated into English, the modest amount of Ferro's published writing (in any language) does not correspond to the significance and value of his work.⁸ But why is this so? Why is Ferro's approach not already better known and widely debated? There are at least three reasons for this: First, Ferro's insights into the role of the discipline are inconvenient. Second, architectural theory and history often focus on the reception of architecture and are only now being challenged by the emerging field of "production studies." Finally, Ferro's work emerged, together with that of his friends Rodrigo Lefèvre and Flávio Império, in the context of Brazil during the 1950s and 1960s.

As for his inconvenient insights, Ferro himself has often stated that he committed "professional suicide" by demystifying architectural design.⁹ Instead of blaming architects for the capitalist production of space or denying their good intentions, he shows that well-meaning concepts are secondary to what design actually achieves. The processes of design—the prescription of building through practices such as drawing, specification, and the production of building information—are, in Ferro's analysis, what enable the subordination of labor at the building site and transform construction into a branch of capitalist production. Of course, today this function is no longer exclusive to architects. What Pierre Bourdieu called the "division of labor of domination"¹⁰ has advanced since the late Gothic period to include engineers, surveyors, contractors, and developers. The point is, however, that none of these professions have ever made recourse to claims of a humanist ethos or an artistic genius to legitimate themselves. The pretension to nobility and the narcissistic wounding at the prospect of its loss belong to architects alone. (Which is probably why Ferro's work has received more attention and critical acclaim among scholars of sociology and the visual arts than among architects.)

With respect to the obstacle of reception studies in the architectural field, we mean those theoretical investigations that center on how architecture affects its publics, whether they are expert contemplators (the keyword being "form") or ordinary users (the keyword being "function"). In the reception studies paradigm, critical theory means questioning the effects of the designed environment: its monotony, its imposing character, its lack of participation, its appropriation, and its flexibility. Typical examples

7 Sérgio Ferro, *Michel-Ange, architecte et sculpteur de la chapelle Médicis* (Paris: La Villette, 2002).

8 Contier, "An Introduction to Sérgio Ferro," 93. See, also, Pedro Arantes, "Reinventing the Building Site," in *Brazil's Modern Architecture*, eds. Elisabetta Andreoli and Adrian Forty (London: Phaidon, 2004), 170–210.

9 Ferro, "Dessin/Chantier: An Introduction," 101.

10 Loïc J. D. Waquant, "From Ruling Class to Field of Power: An Interview with Pierre Bourdieu on *La noblesse d'État*," *Theory, Culture & Society* 10, no. 3 (1993): 25.

of this paradigm ask, to recall some familiar ones: how to look at architecture; the image of the city; the pattern language and the language of postmodern architecture; the social logic of space, body, and memory; experiencing architecture; genius loci; and the seduction of place, topology, and topophilia. Even Kenneth Frampton's essays in *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture* (1995) are, he explains, "not alluding to the mere revelation of constructional technique but rather to its expressive potential."¹¹ Reception studies seeks better products without questioning the social implications of production processes, which, if they appear at all, are mostly mythical gestures: a primitive hut; a man placing a stone to mark a territory; a tribe forming a village; or, last but not least, Martin Heidegger in his Black Forest cottage, building, dwelling, and thinking . . .

Production studies, on the other hand, makes the issue of material production central to architectural analysis, although few historians have taken this route so far. Auguste Choisy was one early exception. The French engineer looked at materials, procedures, and construction methods in his 1899 book *Histoire de l'architecture*, writing about the lives and organization of the workers and the general situation of the construction site in almost every chapter of his text.¹² Sigfried Giedion and Reyner Banham, half a century and a century later, respectively, turned their attention to the techniques, technologies, and ordinary built products of the industrial era but were more concerned with the architectural expression of these developments than with social relations.¹³ Even Adrian Forty, whose chapter on concrete and labor Ferro cites in "Concrete as Weapon," observes the deskilling of labor involved in the production of concrete, but is more concerned with the problem of the perception of concrete's value caused by deskilling, than with its effect on the workers.¹⁴ For Ferro, the lack of attention given to architecture's production is not just an oversight; theory has been complicit in rendering these questions invisible and apparently irrelevant for the field.

Perhaps precisely because it is becoming increasingly evident how little agency or autonomy architects have today over the production of the built environment, we are seeing some new scholars and activists beginning to interrogate these issues. In recognizing architects as workers, new activist organizations such as the Architecture Lobby in the United States or Workers' Inquiry: Architecture in the United Kingdom can prepare the ground for questioning social relations in the production of the built environment. A number of historians are now examining the influence and effects of contracts, regulations, and specifications—Ferro's "prescriptions"—on architecture,

11 Kenneth Frampton, *Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture*, ed. John Cava (Cambridge, MA: MIT Press, 1995), 2.

12 Auguste Choisy, *Histoire de l'architecture* (1899; repr., Paris: Hachette, 2016).

13 Sigfried Giedion, *Mechanization Takes Command: A Contribution to Anonymous History* (New York: Oxford University Press, 1948); Reyner Banham, *A Concrete Atlantis: U.S. Industrial Building and European Modern Architecture, 1900–1925* (Cambridge, MA: MIT Press, 1986).

14 Adrian Forty, "Concrete and Labour" in *Concrete and Culture: A Material History* (London: Reaktion Books, 2012), 225–52.

while others (including sociologists and anthropologists) study the construction site. The work of the Centre for the Study of the Production of the Built Environment, at the University of Westminster, is a notable example; their oral history project *Constructing Post-War Britain: Building Workers' Stories, 1950–1970*, is particularly important in this respect. In most cases, however, design is still understood as an activity that is distinct and separate from production. Ferro's corpus provides a consolidated theory in which architectural design must be understood as the very process through which surplus value is extracted from the production of the built environment.

As for the circumstances in which his work was created, Ferro developed his seminal arguments in the 1950s and 1960s, together with Lefèvre and Império, while studying and, after 1962, teaching at the Universidade de São Paulo. Brazilian architectural practice and discourse was, at the time, caught up in the enthusiasm of national development, which had been crowned by the creation of the country's new capital, Brasília, as the dream of modernism. As Ferro has often said, his own experience of Brasília's construction sites, designing and constructing residential buildings there while still a student, revealed to him the incongruity between a design intended to overcome poverty and segregation, and the miserable conditions in which it was carried out. Although it was the incongruities of Brasília that first prompted Ferro and his colleagues to this line of thought, the theory that developed out of it went well beyond the local circumstances of the Brazilian construction industry in the mid-20th century. This marginal context of a marginal country—where relations of production had not been mitigated by labor laws, unions, a welfare state, or mass entertainment—provided clear evidence of the contradictions that are in fact inherent to any architectural or urban design that is embedded in capitalist commodity production.

In 1970, as a result of his resistance to the military dictatorship in Brazil, Ferro was imprisoned, and upon release he left for France where he continued his research at the École Nationale Supérieure d'Architecture de Grenoble. There, he collaborated with colleagues, most notably Cyrille Simonnet and the Laboratoire Dessin/Chantier, and published his writings in both French and Portuguese. Some scholars and practitioners in Brazil and in France have engaged with his work and disseminated his ideas internationally, but the number remains small.

No matter how well evidenced and convincing Ferro's arguments are, it was unlikely that a refugee from the Global South with neither the right educational credentials nor the social and cultural capital (Ferro was never allowed to practice architecture in France) would establish in the wider architectural field an agenda that challenged the mainstream to such an extent. But it seems to us that there may now be an audience more open to hearing Ferro's hard-hitting account of the role of design under capitalism. Architectural discourse may finally be ready to consider and debate the explanatory force of building production beyond the local context and period in which these remarkable insights emerged.

—Silke Kapp, Katie Lloyd Thomas, and João Marcos de Almeida Lopes

SÉRGIO FERRO

Concrete as Weapon

It would be possible to write quite a history of the inventions, made since 1830, for the sole purpose of supplying capital with weapons against the revolts of the working class.
—Karl Marx, *Capital* (1867)

I.

[It is,] hence, the tendency of capital to give production a scientific character; direct labour [is] reduced to a mere moment of this process.¹ Throughout the 19th century in France, the subordination of labor in building production, which had hitherto been merely formal (without substantial modification of the labor process), tended to become real (with substantial modification of the labor process), as was happening in industrial production. The general economic purpose of this transformation from formal to real subordination or, in Karl Marx's terms, from formal to real subsumption, was the increase of relative surplus value by higher labor productivity through the introduction of machinery and comprehensive prescriptions. The resulting deskilling of labor and the reduction of its reproduction costs allowed for the lowering of wages and therefore the increase of capital profits. The transformation caused profound changes in architecture and construction.

¹ Karl Marx, *Grundrisse: Foundations of the Critique of Political Economy*, trans. Martin Nicolaus (London: Penguin, 1973), 699.

Already by the Renaissance, design had been separated from the construction site and dictated the exterior shape of buildings. As Mario Carpo points out, drawing was limited to schematizing the visible: “With few exceptions, Renaissance treatises define architectural ‘orders’ . . . that are singularly lacking in material weight. What are they made out of? . . . The books don’t tell us.”² At the time, almost all construction know-how remained in the workers’ hands. Under merely formal subordination, “there is no difference in the mode of production itself. The labour process, seen from the technological point of view, continues exactly as it did before, except that now it is a labour process subordinated to capital.”³ Indeed, “construction technique, from the Middle Ages to the Renaissance, and perhaps up to the industrial revolution, does not seem to have had an exceptional development.”⁴ It is true that division and specialization of productive operations had deepened over time, and master builders had been able to exert increasing pressure to speed up the pace of work. Taken together, however, the productive body retained under its domain the essentials of the construction process. This characterizes a formal, external subordination or subsumption of labor, whose economic expression is absolute surplus value, obtained mainly by extended working hours. But even if it is only formal and external, it is still one of the distinguishing marks of capital: it does not exist like this in any other historical period.

The workers’ exclusive possession of the know-how necessary for construction became problematic for capital in the 19th century, especially after the fall of the Second Empire in France in 1870. Social conditions of struggle changed substantially and thus altered the frequency and violence of labor conflicts. Until almost the end of the 19th century, labor organizations, which had been prohibited, limited, and often forced into secrecy, lacked the breadth and efficiency to seriously oppose the domination of capital. The Le Chapelier Law from the beginning of the revolution of 1789–1799 had forbidden any defensive alliance among workers, further weakening their occasional resistance and leaving them only the individual “freedom” to sell their labor power. This did not mean there was an absence of forceful confrontations in revolutionary periods such as 1830, 1848, 1870–1871, and even beyond. But it was only with the establishment of the Third Republic that the consolidation of labor organizations was made possible. Little by little, the first unions were created at the end of the 19th century.

2 Mario Carpo, *Architecture in the Age of Printing: Orality, Writing, Typography, and Printed Images in the History of Architectural Theory*, trans. Sarah Benson (Cambridge, MA: MIT Press, 2001), 7.

3 Karl Marx, “The Results of the Direct Process of Production,” in *Karl Marx Economic Works 1861–1864* (also known as MECW), trans. Ben Fowkes (London: Lawrence & Wishart, 1994), 34:473.

4 Salvatore Di Pasquale, “Brunelleschi, la coupole, les machines,” in *Filippo Brunelleschi, 1377–1446*, eds. Pierre Grandveaud and Monique Mosser, trans. Edith Crescenzi (Paris: Centre d’études et de recherches architecturales, 1979), 22–30, 28. All quotes translated by Alice Fiuza and Silke Kapp, unless otherwise noted.

The Law of 1884 authorizing the creation of unions is the result of prolonged labor struggles, carried out for decades, most often illegally; it is also a starting point for new initiatives: the workers’ organization can now develop openly. . . . It is [however] hampered by the significant heterogeneity of the French working class, a consequence of the broad diversity of industrial structures.⁵

The proliferation of labor disputes was related to the accelerated progress of industrialization, which led to the deskilling of labor, lower wages, the imposition of stricter discipline in the factories, and the increased influence of supervisory and management personnel, which was vigorously contested by the workers.⁶

The birth of the CGT [Confédération générale du travail] in 1895 marked the advent of an extraordinary syndicalism and crowned an epic of self-management: 20 years of revolutionary syndicalism, assumed and claimed as such, which established a remarkable autonomy of labor. . . . The CGT was not created simply to gather workers based on their professional interests. One of its . . . purposes was to offer workers a social and political solution different from the socialism promoted by [political] parties—a solution that revolutionary syndicalists claimed related to the working class, not to socialist politicians.⁷

The organization of labor movements did advance, but with difficulty due to their heterogeneity and lack of experience in legal struggles. Two years after the Law of 1884 was enacted, the Fédération nationale des syndicats et groupes corporatifs de France [National Federation of French Unions and Corporate Groups] was founded as the first attempt to unify the labor movement, bringing together several trade-based associations. In 1892 the Fédération des bourses du travail de France [Federation of French Labor Exchanges] followed, declaring itself independent of the State. At the Congress of Nantes in 1894, this federation, together with the trade unions, voted for one of the fundamental principles of the incipient labor struggle:

Considering that in presence of the military power put at the service of capital, an armed insurrection would just offer the ruling classes a new opportunity to stifle social demands in the workers’ blood; That the last revolutionary means is, therefore, the general strike;

5 Jean Bron, *Histoire du mouvement ouvrier français*, vol. 2, *La contestation du capitalisme par les travailleurs organisés, 1884–1950* (Paris: Éditions ouvrières, 1970), 53–55.

6 Anne Steiner, *Le Temps des révoltes: Une histoire en cartes postales des luttes sociales à la “Belle Époque”* (Paris: L’Échappée, 2015), 8.

7 Olivier Besancenot and Michael Löwy, *Affinités révolutionnaires: Nos étoiles rouges et noires: Pour une solidarité entre marxistes et libertaires* (Paris: Mille et une nuits, 2014), 31–32.

The 6th Congrès national des syndicats ouvriers de France [National Congress of French Labor Unions] decides: It is necessary to proceed immediately to the organization of the general strike.⁸

The general strike, seen as a precondition for the social revolution that would eliminate capitalism, became the main banner of the French labor movement until the eve of World War I.

In one way or another, they all vehemently contested the system of capital.

At the same time, a number of (often ephemeral) socialist political groupings emerged: Parti ouvrier français [French Workers' Party], Parti ouvrier socialiste révolutionnaire [Revolutionary Socialist Workers' Party], Comité révolutionnaire central [Central Revolutionary Committee], and various very influential anarchist groups. The Section française de l'internationale ouvrière [SFIO, French Section of the Workers' International], affiliated with the Second International, was also established. In one way or another, they all vehemently contested the system of capital. However, the trade unions and *bourses du travail* (labor exchanges) believed they could destroy capitalism through their independent action; they avoided mixing with those other political organizations.

In the industrial struggle alone the worker actually confronts his nearest enemy, the capitalist; in that struggle alone can he practice "direct action," action not perverted by intermediaries. . . . Its highest form is the general strike, which the anarchosyndicalists regard as the means of overthrowing not merely capitalism, but also the state . . . This was a teaching that reinforced the anarchist's traditional rejection

8 Fernand Pelloutier, "Chambre syndicale des journalistes socialistes," in *Compte rendu des travaux du congrès tenu à Nantes du 17 au 22 Septembre 1894: 6me congrès national des syndicats de France, publié par les soins de la Commission d'Organisation* (Nantes: Schwob et fils, 1894), 48–49.

of political action, since the syndicate seemed to provide a practical alternative to the political party.⁹

Suspicious of the Third Republic, the unions became openly aggressive and were averse to political and eminently class-ridden mediation. The two former republics had betrayed the revolutionary movement that created them, replacing the solution of the "social question" (work, education, health, old age, wages) with the political interests of the bourgeoisie. Their leaders had taken part in the Commune, and they were anarchists rather than socialists or communists. They no longer struggled to meet the "social question" but instead aimed at productive autonomy, self-management, and above all, revolution. Many people—not just militant leaders—regarded a revolution as possible in the short term. "The defeat of the bourgeoisie . . . was considered rapid and fatal; a successful strike, an electoral victory made revolution seem close; socialism was by then often messianic."¹⁰ The most striking event in trade union life during that time was the penetration of anarchist activists after the failure of their series of attacks from 1892 to 1894.

Thus, until 1902, anarchists assumed leading roles in the CGT and gradually spread their ideas, their means of action, and their perspectives about the future city. They pushed for direct action but progressively moderated their hostility to partial strikes . . . : as "revolutionary gymnastics," they educated workers by showing them the real face of their opponents. Many of them had initially believed in the possibility of a general strike in the short term. . . . Until 1906, this mode of union action was called anarchosyndicalism [or revolutionary syndicalism]. . . . The statutes of these unions were quite diverse, but . . . the necessity to overthrow the capitalist regime was stated almost everywhere.¹¹

The repressive apparatus of the Third Republic reacted violently to the prerevolutionary effervescence of the working class. In a crescendo that lasted at least until 1909, long and aggressive strikes provoked harsh confrontations, causing repression, many deaths, expulsions, arrests, and some rare social achievements. These, however, were not priority objectives. For the revolutionary syndicalists of the CGT, the absolute priority was the preparation for an imminent social revolution. The second item of the first article of the statute voted by the CGT congress in 1902 reads: "Outside of all political schools, the CGT gathers together all workers conscious of the fight to be carried out for the disappearance of the salaried and of employers."¹² In political terms, the SFIO's aims were revolution through class struggle, the destruc-

9 George Woodcock, *Anarchism: A History of Libertarian Ideas and Movements* (Cleveland, OH: Meridian Books, 1962), 321–22.

10 Bron, *Histoire du mouvement ouvrier français*, 2:61.

11 Ibid., 82–85.

12 Jean Bruhat and Marc Piolot, *Esquisse d'une histoire de la CGT (1895–1965)* (Paris: Confédération générale du travail, 1958), 54.

tion of capitalism, and progress toward a society of equals. A society divided into opposition and radicalized into antagonistic positions could either be animated by hope or haunted by fear. In terms of social struggle, the workers' unrest and their numerous strikes that harmed the economy deeply disturbed the dominant classes. As we have seen, embedded in all strikes, regardless of their immediate cause, was a revolutionary appeal that was connected directly to the radical transformation of production processes. For capital to refrain, hinder, prevent, or repress strikes became a matter of survival. The revolution apparently implied by each acute class confrontation (as a "revolutionary exercise" or as a provocation to be suppressed mercilessly) composed the horizon expected by the majority of the working class.

2.

In the riots of 1830, 1848, and 1871, the building, furniture, clothing, and mechanical trades provided a disproportionately large number of combatants considering their numbers in the overall Parisian population. . . . Carpenters and joiners, painters and masons . . . were the force behind the large union uprising of 1875–1876, at the peak of the first great wave of industrialization in France, before reemerging, a few years later, in the genesis of a workers' party.¹³

Construction workers were resolutely engaged in this awakening. The powerful Fédération du bâtiment [Federation of Construction Workers], the backbone of the CGT, was the nest of revolutionary syndicalism. They had an important trump card in a fight whose tactics of direct action or confrontation at the workplace lay entirely beyond the interference of political parties. For, despite the losses they had suffered, they still held the almost exclusive domain of construction know-how.

Building construction was still a manufacture,¹⁴ and thus a target of permanent contestation, because it subordinated labor only formally, externally. Protest came mainly from workers involved in crafts related to stone and timber, by then the most widely used and most determining materials. Stonemasons and carpenters, central figures at any construction site, were considered the "aristocracy of construction" as well as the "labor aristocracy" in general.¹⁵ Any strike is much more drastic when the striking workers control the essential elements of production: if they stop, the rest must stop as well—and this is all the more true if the employer cannot easily replace them. Construction labor organizations, still structured by craft and close to

the tradition of mutual help between those affronted by capital, fostered solidarity (the Fédération du bâtiment dates from 1907, and only then did construction labor cease to be organized by craft). "If a strike, especially in the building sector, was interfered with by strikebreakers [*jaunes*], patrols were organized to intimidate them. . . . This brutal class solidarity was the specialty of the navvies, . . . the shock troops . . . of the Fédération du bâtiment and the honor of the CGT."¹⁶ The cessation of work on building sites closed down one of the most abundant sources of surplus value in social production. Construction work lavishly nourished rent and industry,¹⁷ those sectors of the economy that were not manufacture: for capital, times were bleak and menacing.

Almost spontaneously, through the force of circumstance, building crafts became the vanguard of anarchist syndicalism. The industrial labor force represented only 5 percent of the working class, while manufactures and small hybrid—partly handcrafted—production units still prevailed. Among the former, construction was hegemonic. "The French world of work remained that of urban crafts, in particular those of furniture, building, and clothing. . . . [The workers] maintained the power to freely carry out their tasks, which bound them to the skilled craftsmen of the ancien régime, these craftspeople [*gens de métier*] distinguished from mere manual laborers [*gens de bras*] by a know-how that came from long apprenticeship and experience, which did not separate physical exertion from intelligence, the ability to execute from the power to create."¹⁸ Curiously enough, in the century of industrialization and real subordination, behind the visionary discourses of the time, craftsmanship and formal subordination still prevailed, and were at the basis of the explosive movement in the world of work. "The 1900s syndicalism of direct action . . . undoubtedly brought this syndicalism of crafts [*syndicalisme de métier*] to its peak: . . . it is not by chance that the people in the building, leather, and clothing crafts are so strongly involved in it."¹⁹ Predominant among the crafts were those with "monopolizable skills" (David Harvey's expression),²⁰ those depending on a specific know-how entirely in the workers' hands. Chief among them were the crafts of stonemasons and carpenters, having greater economic and social impact. Alongside them, the emblematic navvies [*terrassiers*]—giants with red flags tied at their waists, characteristic figures also of the conflicts at construction sites and the constant street fights—completed the trio of great class enemies of capital in the social imagination, reclaiming and preaching revolution almost every day. However, "the workers' dream was not to take control of society; revolution meant to take ownership of the instruments of their crafts, and in the CGT the future world was always imagined as a set of professional

13 Yves Lequin, "Le métier," in *Les lieux de mémoire*, ed. Pierre Nora (Paris: Gallimard, 1997), 3:355.

14 Translators' note: "Manufacture" is meant here as Marx defines it: a combination of handicrafts as opposed to machinery and modern industry. See Karl Marx, "Division of Labour and Manufacture," in *Capital*, trans. Ben Fowkes (London: Penguin Books, 1990), 1:455–91.

15 Guillaume Davranche, *Trop jeunes pour mourir: Ouvriers et révolutionnaires face à la guerre (1909–1914)* (Paris: L'Insomniaque & Libertalia, 2014), 30, 57.

16 Ibid., 30–31.

17 Translators' note: "Industry" is meant here as machinery driven, as opposed to manufacture. See Marx, "Machinery and Modern Industry," in *Capital*, 1:492–642.

18 Lequin, "Le métier," 3:353.

19 Ibid., 3:356.

20 See David Harvey, *The Limits to Capital* (Oxford: Basil Blackwell, 1982), 59.

federations for which the islands of worker autonomy within the capitalist world were all tooting stones.”²¹

In my view, there was another reason for the close correlation between construction and anarchism, similar to the one that correlated anarchism with Neo-Impressionist pointillism in the same historical period. It was a structural affinity. An ideal constitution of manufacture in construction would resemble the paradigmatic model of an anarchist society. I do not mean manufacture as developed by capital in real practice. As I have already discussed in other texts,²² there is a striking relation between capital and manufacture; historically, capital placed and displaced manufacture from its construction sites. The ideal manufacture that I mean would strictly observe the productive logic implied by its operational composition. This is not the case in manufacture used for exploitation, which is severely deformed by the demands of techniques of domination. Ideal manufacture would be composed as an association of several teams specialized in a rather small number of crafts (between 10 and 15 in general). Such an association could be cumulative, so that the works of each team were added to the preceding ones (serial manufacture), or it could be articulated as a simultaneous prefabrication of components by various teams (heterogeneous manufacture). In the historical period that concerns us here, serial manufacture dominated. Building teams were organized around the specific practices of each craft and strongly differed from each other in technical terms. The team that was building the structure was completely distinct from the one in charge of, say, the plumbing or the electrical part. If each team concentrated on its own specialty and did the best work possible, ensuring the interfaces with other teams were reduced and anticipated in detail, the result was a harmonious, respectful, and mutually stimulating coexistence, equivalent to the simultaneous contrast found in Neo-Impressionist works as well as to the anarchist harmony of opposites—obviously, as long as the construction site was self-managed. This structural affinity intensified at the end of the 19th century, when the small production units, still submitted to capital only in form, that is, still zealously guarding their knowledge and know-how, could organize into trade unions. The effective possibility of a revolutionary transition to a manufacturing practice in construction with anarchist tenor seemed within the workers’ reach.

In November 1910, the building trustees’ congress set up a solidarity fund against strikes,²³ following the example of the Union des industries métallurgiques et minières [Union of Metallurgies Industries]. Employers began to organize collectively to resist the growing revolutionary threat inspired by the Mexican Revolution beginning in 1910 (widely publicized by the Fédération révolutionnaire communiste

21 Lequin, “Le métier,” 3:357. Translators’ note: A “tooting stone” is a projecting stone or tenon at the end of a wall, allowing for another building or wall to be bonded into it when required.

22 See Sérgio Ferro, *Arquitetura e trabalho livre* (São Paulo: Cosac Naify, 2006).

23 See Paul Poncelet’s drawing in *La guerre sociale* from November 23, 1910, reproduced in Davranche, *Trop jeunes pour mourir*, 175.

[Revolutionary Communist Federation]). Measures against possible labor riots went far beyond mutual financial help, involving a wide range of initiatives, from corruption of union leaders, journalists, and all kinds of representatives to productive strategies to suppress the workers’ weapons of resistance, such as the monopolizable crafts. The so-called scientific management of labor began its effort to dismantle any trace of horizontal agreement in the production units. In 1914, hopes for an anarchist revolution at the construction sites disappeared for a long time.

3.

With almost no premeditation, capital took a side road to creep out of the trap implied by merely formal subordination of construction work. Chance discoveries gradually converged toward an unexpected outcome.

Since the beginning of the 19th century, under the influence of the first industrial revolution and the *doxa* coined by the Enlightenment, the most provident sectors of manufacture had been banking on “rationalization” and expanding prescriptions to better control the insubordinate know-how. We must keep in mind that production manufactures such as construction remained at this technical stage due to macroeconomic imperatives: they could not resort to industrial machinery because of the risk of large-scale economic disaster.²⁴ To compensate for this handicap, the development of building science accelerated, and design specifications became more demanding, precise, and comprehensive. Detailing penetrated into the flesh of what was to be constructed, assigning components and materials. The hegemony of productive capital required careful control over the costs of human and material means of production. Quantitative reports stacked components, measures, and prices into their lists, prompting comparisons and advantageous substitutions. The inflation of detailed prescriptions reproduced what had become inevitable in industrial production.

Diverging from this (so far) simply mimetic picture, something occurred in 1840. Michel Ragon notes the fact as a banal curiosity:

It is interesting to remember that the iron frame was born as a result of a building strike. . . . As the strike lasted a long time and paralyzed the construction work, the Creusot establishments had the idea of making iron beams in series. If this substitute material did not completely dethrone timber, it at least gave birth to a new craft. Henceforth, the mechanic would tend to replace the mason, as the engineer would supplant the architect. . . . The industrialists had used the iron frame as a strikebreaker.²⁵

24 See Ferro, *Arquitetura e trabalho livre*.

25 Michel Ragon, *Histoire mondiale de l’architecture et de l’urbanisme modernes* (Tournai: Casterman, 1986), 1:213.

The divergence is only apparent. This was the distant seed of the unexpected—although not very imaginative—outcome. It would be twofold and would provoke a new expropriation of labor. It has long been known that the best way to push a change in the correlation of forces within the production process is to change the rules of the game in some way. For example, in order to dismantle the simple cooperation between workers who had erected the primitive Gothic buildings and to transform it into the exploitative manufacture of the Renaissance, the separation between design and building site had to rely on an arbitrary substitution of the formal language to become truly effective. Renaissance design adopted classical vocabulary, dismissing the visual language of the primitive Gothic, traditionally shared by the associated workers. At the end of the 19th century, substitutions would be of another kind, but they had a similar combative mission. It was a question of further disarming the working class by eliminating its last remaining possibilities of self-determination in formal subordination: the operational control of the basic material of their crafts.

Until the last decade of the 19th century, capital's commitment concentrated on improving and detailing prescriptions—exhaustively if possible. This was a demand, I repeat, of the generalization of the law of value due to the evolution of productive capital. But in the case of well-established traditional crafts, such as timber or stone, prescriptive ambitions faced serious resistance, and even irony. They were redundant, pedantic, and useless. “The most beautiful cathedrals were already standing when Desargues and Monge came to teach us laborers how we should carve the stone and the timber. . . . Do not continue to contest the legitimate possession of the scientific capital which is ours, which we have transmitted from generation to generation,” Agricol Perdiguier protested on the behalf of all craftsmen.²⁶ Enclaves of monopolizable technology were the most resistant to the advance of subordination, which was the goal of the more detailed prescriptions. This is why the end of the century witnessed the emergence of new materials not controlled by monopolizable crafts—in particular, iron and reinforced concrete, as showcased in almost every history of modern architecture. They are the weapons to which capital resorted instead of machines, establishing an ersatz of real subordination in realms such as construction, where it was impossible to replace manufacture by modern industry. The new materials disarmed the workers by taking the place of those materials that had underpinned crafts based on traditional know-how.²⁷

Apart from avoiding (still rather unorganized) strikes, capital at first achieved only limited gains from the use of iron instead of timber. Iron was used mainly in

26 Agricol Perdiguier, “À propos d’une opinion de MM. Arago et CH. Dupin,” (1846) reprinted in *Dessin/Chantier* 1 (1980).

27 I do not know if it is possible to generalize what took place in building construction, but in this case—contrary to what the USSR-devoted communist parties would later preach—transformations and impasses in the relations of production have determined changes of the productive forces, not always toward their “progress.” Marx often points out the correlation between important strikes and the creation of machines that altered previous productive processes.

constructions related to constant capital (the part of capital that does not generate immediate surplus value for the industrialist and therefore should be reduced as much as possible, although technological progress imposes ever more expensive machinery), such as factories and warehouses, or in commodity circulation, which also immobilizes capital in roads, bridges, railway stations, and so on. In all these cases, the purpose was to build at the lowest possible cost (hence the absence of architects), and their mandatory—always economic—rationality engendered wonders: boarding platforms at railway stations, industrial exhibition halls, bridges of cast or laminated iron, to name a few. The use of iron by architects such as Henri Labrouste and Hector Horeau was either an exception or served as a discreet, carefully disguised substitute.

Only later, at the beginning of the 20th century, did the uses of iron expand. The building of the Eiffel Tower, finished for the World’s Fair commemorating the centenary of the revolution of 1789, also celebrated the victory of iron construction. “The sudden, rapid construction of the tower marked the end of an era: the Age of Stone was over, the Age of Iron had begun. . . . [N]o one seriously doubted that the next century would be the century of iron. . . . [However,] [b]y the beginning of the twentieth century, reinforced concrete was on the rise and soon replaced metal in prestige projects.”²⁸ In the midst of this victory, another, much more subtle one prepared building construction for a mutation that only decades later (in France, after World War II) would establish itself on large construction sites. “The construction on the Champ-de-Mars proceeded as it had been planned in the Eiffel factory at Levallois-Perret: “The various pieces were fully prepared off the work site, while on the site they were scrupulously fitted together and assembled.”²⁹

In large-scale iron constructions, the serial manufacture of traditional construction (essentially an on-site cumulative process) was surpassed by heterogeneous manufacture (essentially based on prefabrication), which, in terms of division of labor, requires concentrating detailed prescriptions at the top: “[T]he Eiffel Tower was seen initially as a triumph of the art of the engineers.”³⁰ By and large, this change caused an increase in relative surplus value, and thus a wage reduction, all the worse as it was accompanied by a sense of social injustice and caused by the sudden disdain for the metalworkers’ knowledge and know-how: in the assembly of the tower, they were largely replaced by . . . carpenters! Nothing could be more absurd for a monument celebrating the triumph of iron construction. “The values linked to a profession became impracticable due to the methods of work organization.”³¹

28 Henri Loyrette, “La Tour Eiffel,” in *Les Lieux de mémoire*, ed. Pierre Nora, vol. 3 (Paris: Gallimard, 1997), translated by Arthur Goldhammer and published under the title “The Eiffel Tower” in *Realms of Memory: The Construction of the French Past*, ed. Lawrence D. Kritzman (New York: Columbia University Press, 1998), 3:357–58.

29 Loyrette, “The Eiffel Tower,” 3:355. He cites Gustave Eiffel, *La tour de trois cent mètres* (Paris, 1900), 100.

30 Loyrette, “The Eiffel Tower,” 3:356. Translators’ note: The English version translates *l’art des ingénieurs* simply as “engineering”; we’ve changed this.

31 Emmanuel Renault, *L’Expérience de l’injustice: Reconnaissance et clinique de l’injustice* (Paris: La Découverte, 2004), 212.

In the case of concrete, the advantages for capital began to draw attention later (in France even later than in England) and were not limited to an immediate cost reduction. Most important was that concrete, unlike iron, did not entail any historically accumulated know-how, any tradition of crafts that welded the alliance of the workers in charge of its production. This absent or incipient know-how did not, as did the crafts of stone and wood, constitute a weapon, a workers' monopoly to be used in class struggle and to reinforce strikes of direct action. Concrete was a weapon—but for capital.

The concrete crafts that were part of the building industry around 1900 did not display the pride proper to the heirs of the *compagnonnage* [craft guild fellowship], as the masons, carpenters, and stonemasons still did. They had no emblem or patron saint. . . . Dictionaries and manuals on masonry up to the very end of the 19th century still ignored the specific terminology (tools, practices) introduced by the handling of concrete. The first manuals of reinforced concrete gave little information on labor practices and organization of tasks that the use of reinforced concrete brought about.³²

To the early advocates of concrete, its appeal was that it offered an *alternative* to current methods of construction, and in the context of 19th-century Britain, this “alternative” meant something more radical than simply the deskilling of the existing trades. Concrete offered a chance to bypass the traditional trades altogether, to break their monopoly over construction, by making it possible to build without any need for them at all.³³

Even more than iron, this artificial material requires calculation, precise technical details, exact quantification of components, and so on. It implies complex knowledge that has little relation to the empirical know-how and approximate methods of masons and carpenters; at least this is what experts say (although until 1906 “very few inventions sought to legitimize themselves by means of calculus or mathematical formula”³⁴). Such instruments were inevitably in the hands of engineers and technicians, who, following the customs of the industrial management that had by then invaded every corner of society, were not willing to disclose them to the workers. “No other means of construction allowed such a satisfactory separation of the mental from the manual elements of labour.”³⁵ The weapon of workers' know-how gave way to the weapon of presumed prescriptive knowledge. A chiasmus: at the construction site the know-how declines, resulting in deskilling and deeper subordination of the workforce; knowing emigrates, distancing itself more and more from doing, and draws more power and aura into capital.

32 Cyrille Simonnet, *Le béton, histoire d'un matériau. Économie, technique, architecture* (Marseille: Parenthèses, 2005), 59.

33 Adrian Forty, *Concrete and Culture: A Material History* (London: Reaktion Books, 2012), 226–27.

34 Simonnet, *Le Béton*, 100. See also Cyrille Simonnet, *Robert Maillart et la pensée constructive* (Gollion: Infolio, 2013); and Gwenaël Delhumeau et al., *Le béton en représentation: La mémoire photographique de l'entreprise Hennebique 1890–1930* (Paris: Hazan, 1993).

35 Forty, *Concrete and Culture*, 232.

Note, however, a curious intersection of factors. As Adrian Forty observes:

America's national myth was that the country's industrial strength had come about through the way it had overcome its shortage of skilled craft labour by developing methods for the mass production of components that could then be assembled by unskilled labour . . . Reinforced concrete, which required a lot of craft labour for the fabrication of formwork, did not correspond to the American industrial principle, whereas steel construction, with factory-produced components assembled on site, fitted it perfectly. Even Albert Kahn, who might have been expected to stand up for America's title to reinforced concrete, seems to have been willing to accede it to the Europeans for this reason: as he put it, “with labor costs much lower and careful workmanship more general than here, it was only natural that they [Europeans] should produce results quite impossible in this country.”³⁶

The reduced contingent of skilled craftsmen in the United States fostered the use of iron and the transformation of construction from serial into heterogeneous manufacture. In France at the beginning of the 20th century, conversely, the sabotage of the timber trade liberated a large number of skilled craftsmen, who were forced to limit their know-how (and hence the price of their labor power) to the most elementary assembly of wooden molds for reinforced concrete. Only later, in the postwar reconstruction period, did the prefabrication of concrete panels make possible the change from serial to heterogeneous manufacture. The delay of industrialization in France led to much more complex choices concerning production than in countries where the lack of skilled labor or its deskilling by advanced industrialization pushed construction toward the heterogeneous form of manufacture (not be confused with its “industrialization”).

However, during the period of 1890–1910 this new know-how spread in the companies, which meant . . . a clear destructuring of “craft,” presumably for the benefit of a business know-how (or culture) more able to manage, to organize, to divide the tasks or functions than 20 or 30 years before.³⁷

It was not the site worker, who was rather resistant to an invention that to a certain extent dispossessed him of his mastery of work, but the entrepreneur, an entirely modern function in the powerful run of the industrial revolution, who carried the new “knowledge” related to the technique of reinforced concrete.³⁸

36 Ibid., 108–9.

37 Simonnet, *Le béton*, 65.

38 Ibid., 83.

The “birth” of reinforced concrete was rather the formulation of the discourses that described it, that carried it to the various scenes where it had to be shown, exhibited.³⁹

This shift increased the amount of relative surplus value achieved, a welcome development given the growing demands for reduced working hours, which threatened the amount of absolute surplus value extracted.

They were excellent in their crafts—and they were anarchists.

Little by little, wood and stone left the construction site along with traditionally trained carpenters and masons—hindrances to the new kind of domination—until a tacit prohibition of these materials came to prevail during the first period of modernism. They would no longer be the pivots of construction: the growing hegemony of industrial capital and its management put an end to a tradition of several centuries. This change, coupled with police persecution, forced the more engaged workers to emigrate. Many of them landed in Brazil, especially the Italians, because of their linguistic proximity. In general, they had one and the same profile: they were excellent in their crafts—and they were anarchists. The Brazilian labor movement owes them a great deal.

4.

Real subordination of labor as theorized by Marx results mainly from the incorporation of science and technology into production management. Industrial mechanization is its most visible manifestation. In construction, however, the mechanization of production is problematic: apart from the use of some secondary machines, construction must remain a manufacture. I repeat the argument linked to what Marx considers one of his main discoveries: the tendency of the rate of profit to fall.

Thanks to the amount of labor power employed by construction, much higher than the amount mobilized by industry (more variable capital in relation to constant

³⁹ Ibid., 111.

capital) and to the enormous significance of construction in the economy of any country, this productive sector, considered to be technically “backward,” is nevertheless essential for the survival of capitalism—precisely because of its backwardness. The gigantic mass of surplus value produced by these manufactures not only feeds the accumulation of capital but, by equalizing the average rate of profit, slows down its (global) fall, unavoidable due to the advance of industrialization.⁴⁰ Industrialization of construction is technically feasible, as the London Crystal Palace (1851) or the city of Cheyenne in the United States (1867) showed in the mid-19th century. However, as previously mentioned, it would have provoked an economic disaster, especially in the middle of the second industrial revolution, eager for more surplus value.

Construction apparently reached a stalemate: because of its position in the political economy, it could not follow modern industry in implementing real subordination via mechanization; at the same time, it could not remain dependent on the workers’ know-how, especially with their growing rebellion in the midst of revolutionary and anarchist syndicalism. The solution to the impasse lay in replacing monopolizable crafts (wood and stone) with non-monopolizable ones (those not suitable as working-class weapons, such as concrete and iron) and in adopting industrial management through the centralization of knowledge and through authoritative, meticulous prescription.

What, however, Hennebique’s operational methods revealed was the extent to which it was possible, with concrete construction, to detach the skilled, mental work of building from the purely manual element. The opportunities that concrete provided for such a division of labour is what really distinguished concrete and made it uniquely different from all other construction processes in labour terms. . . .

Whereas in other constructional methods, the traditional trades retained control over much of the organization and quality assurance of the work, with concrete this was almost entirely removed from the site operative into the hands of site supervisors and engineers, a separation that continues to this day. . . .

It was the opportunity that concrete provided for this division of labour that set it apart as unique amongst construction materials, and was the cause, as we shall see, of the fascination of the new discipline of scientific management with concrete in the early 1900s.⁴¹

These remarks by Adrian Forty are essential. They accurately place the core of technological change at the turn of the 20th century. The traditional trades’ control over much of the labor process became incompatible with capital’s ambition to assume its full and exclusive command in the face of the attack from the world of work.

⁴⁰ See Karl Marx, “The Relationship between Rate of Profit and Rate of Surplus-Value,” in *Capital*, trans. David Fernbach (London: Penguin Books, 1991), 3:141–62.

⁴¹ Forty, *Concrete and Culture*, 232, 234.

Since the first industrial revolution, capital had incorporated science and technology to increase its power over the working class, to deskill it, to lower wages, and to increase surplus value. But by the end of the 19th century, when new and different forms of class struggle emerged as never before, it became a priority to disarm the working people as much as possible, both through the use of political and ideological manipulation and through accelerating scientification and detailed control of the productive process. Any steps in the productive process where control could weaken, leaving openings for the dangerous intrusion of monopolizable crafts, were eliminated. In this period prior to the establishment of large units of industrial production, the labor movement was, as we have seen, deeply marked by emerging union struggles dominated by revolutionary syndicalism, that is, by the hope and preparation of a radical revolution, largely animated by workers of the traditional construction crafts. Reinforced concrete was a perfect device for disarming these turbulent construction workers: it required top-down knowledge and detailed prescription, and it took the place of crafts that were at the forefront of the workers' offensive.

The example spread gradually, until it reached all technical sequences of the building process: in order to dispossess workers from the triumph of their traditional crafts, the pretentious technical knowledge (and, if possible, the knowledge of new materials) was concentrated at the top, deskilling the work underneath, thus depreciated and prepared for additional subordination. Marx repeats it constantly: alongside its most evident commodities, capital also produces the conditions for the increased exploitation of its most essential commodity, which is labor power.

The tension engendered by the renewed pressure of the labor movement at the end of the 19th century seems to have catalyzed capital's intuition. Suddenly, previous experiences and theoretical speculations that had been scattered were condensed into a diligent effort around concrete, quickly articulating the manifold advantages of this young material as a promising whole. Since 1880, structural calculation had been evolving with Jean Bordenave, François Coignet, François Hennebique, and Johann Bauschinger; Anatole de Baudot (fully aware of the class struggle described above) and Auguste Perret built works in concrete; Tony Garnier dreamed of his industrial city; and the incipient scientific management of labor adopted concrete as the ideal material.⁴²

From this precise moment, around 1900, the adventure of reinforced concrete truly begins.⁴³

Reinforced concrete did not come into common employment on a large scale until the 1890s.⁴⁴

⁴² See *ibid.*, 236–40.

⁴³ Ragon, *Histoire mondiale de l'architecture*, 1:248.

⁴⁴ Sigfried Giedion, *Space, Time and Architecture: The Growth of a New Tradition* (Cambridge, MA: Harvard University Press, 1982), 325.

Between 1910 and 1920 it became almost the trademark of the new architecture.⁴⁵

Virtually all architectural historians point to the sudden emergence of the new material as the technical foundation of modernism. But they do not explain why it emerged, and why at that time. They give the impression that, suddenly, an unexpected technical finding opened up hitherto unsuspected doors. However, between the first marginal experiments with reinforced concrete (by Joseph-Louis Lambot in 1848 and Joseph Monier in 1849) and the commercial explosion of the Actien-Gesellschaft für Monierbauten starting in 1889, and of Hennebique's company (which took reinforced concrete to 31 countries between 1894 and 1906), the career of this material rapidly gained momentum. It was pushed ahead at full steam, right at the turn of the century when, I repeat, the intense struggle between dangerous crafts and the new demands of productive capital were fanned by the intense attack of revolutionary syndicalism.

5.

The cycle of subordination of labor that had begun in the Renaissance reached its peak in modernism. It is always important to remember that subordination refers to capital: before, labor could be exploited—even barbarically exploited—but not substantially subordinated. Subordination and capital are inseparable and interdependent. It is for this reason that I put the subordination of (material) labor as a common ground of both our (capital's) architecture and our (capital's) visual arts; the first takes sides with the subordinators, the second tries to get close to their opponents. This unique feature of productive capital, which has supplied the red thread of our history since then, specifies the core of these two activities ingrained of and in material labor.

Modernism declared the language of the banned sinful.

At the turn of the 20th century, subordination leapt from formal to real or, in construction, to a substitute of real. As a response, the visual arts radicalized their

⁴⁵ *Ibid.*, 322.

negativity. The architecture of modernism, on the contrary, veiled the tactical turn of economic exploitation with an aura. A new form, superficially different from those of the disgraced materials and crafts, celebrated its sordid foundation. Modernism declared the language of the banned sinful. In the name of “purity” and “reason,” it imposed a white hygienic shroud to conceal the deskilled work. While for William Morris, ornament was the popular art par excellence, modernism pronounced it to be a crime. In a good example of backward hegemony (a concept by Francisco de Oliveira⁴⁶), and without any shame, the discourse of the architectural profession has put the “social question” as a goal of a transformation whose foundation in fact came from the opposite direction, as a farce of the tragically betrayed 19th-century revolutions. To the workers whom it objectively degraded, modernism promised a reward: the return, with interest, of what had been taken away from them . . . someday. Adam Smith’s “invisible hand” guided in the dark the hands of the “heroic” pioneers of our renewed craft, who drew and prescribed the opposite of what they proclaimed in their manifestos.

6.

The discrepancies between what was said and what was done are curious. Reinforced concrete, together with iron, was elected as the quintessential material of modernism. It was celebrated by most architects as the miracle of its time, but the way reinforced concrete is used almost always contradicts its potentiality. A material that can follow the stress curves is used mostly for rectilinear frames, which are appropriate and suitable for those whose purpose is centered on surplus value. Jean-Baptiste Ache notes that “a material that we can pour, even if it has a frame, that we can in fact curve, cannot truly justify the rectilinear, cubist aspect of the architecture of that time.”⁴⁷ To see clearly the increasing misapplication and deviation in the use of reinforced concrete, it is enough to compare the right-angled shapes of almost all buildings in our cities with some proposals of Eugène Freyssinet (the airship hangars at Orly, 1916) and Robert Maillart (the Valt schiel Bridge in Switzerland, 1925–1926), that is to say, proposals that are marginal to concrete’s use at the time, submitted to norms unrelated to the constructive reason of the materials actually employed.

At the beginning of its history, concrete was molded into shapes and functions identical to those customary to the materials being replaced. Its original mission was to substitute, while the utilization of its specific qualities was hybrid and secondary.

⁴⁶ See Francisco de Oliveira, Ruy Braga, and Cibele Rizek, eds., *Hegemonia às avessas: economia, política e cultura na era da servidão financeira* (São Paulo: Boitempo, 2010).

⁴⁷ Jean-Baptiste Ache, *Éléments d’une histoire de l’art de bâtir* (Paris: Éditions du moniteur des travaux publics, 1970), 407.

By the end of the 19th century, theories and experiments in concrete were mostly elaborated according to Monge’s concepts and schemes of representation, which were poorly suited to concrete’s material reality. The incipient knowledge of reinforced concrete was borrowed from the outside, from the domain of timber and iron. These hypotheses and ideas were not always the best for its case. However, this improper way of thinking stayed in place and was even exacerbated. We see it, for example, in the scheme advertised by Hennebique’s company: “All configurations submitted to the central office must be reduced to a more or less complex combination of simple elements corresponding to straight, simply supported, overhanging or fixed beams. The Hennebique floors, as Maillart pointed out, are combinations of primary and secondary beams carrying small slabs comparable to hollow-core slabs.”⁴⁸ In broad terms, this scheme guided the theoretical fervor of the late 19th and early 20th centuries (Coignet, Josef Melan, Charles Rabut, Julius Bauschinger, Paul Christophe, Wilhelm Ritter, etc.), and was replicated by the emerging proposals to generalize the use of reinforced concrete, such as Garnier’s plans for an industrial city (1904) and the Perret brothers’ building at the rue Franklin (1903), allegedly the first coherent application of the frame principle. The greater part of modern architecture followed the linchpin of these orthogonal structures. With some exceptions, such as works already mentioned (Maillart, Freyssinet) and later those of Eduardo Torroja, Pier Luigi Nervi, and others, concrete, an alternative material, would rarely be used without betraying its nature.

Once separated from the building site, prescriptions necessarily adopt the graphics of regular dihedrals. They are the most common graphics in architectural representation, and also the most elementary and effective at the building site in view of the intensification of production times. Overall orthogonality avoids the spending of time on complex adaptations that would be needed if the forms to be constructed were irregular or unusual. Indeed, those irregular and unusual forms—now admired in medieval architecture prior to the 13th century—had been rejected since the time when design as such first came about. Even in the digital age, with the exception of luxury works designed in the offices of famous architects, and two or three nonstandard components designed to connote the “contemporary,” Mongeian space still prevails. Architecture submissively adopts the spatial genre that is the most profitable from the point of view of relative surplus value, and certainly the least favorable to relations of empathy, let alone to rewarding work. Orthogonality thus flows from representation to architectural forms, from epistemology to the building site, from a supposed “aesthetics” of reinforced concrete to the “universal” dimension of modern architecture.⁴⁹

⁴⁸ Simonnet, *Le Béton*, 109.

⁴⁹ See Réjean Legault, “Il materiale e la modernità” in *Rassegna* 49 (1992): 58–65; and Réjean Legault, “L’appareil de l’architecture moderne: New Materials and Architectural Modernity in France, 1889–1934” (PhD diss., MIT, 1997).

The slippery and invading power of this system becomes more apparent if we consider some oddities in common practice that are, in essence, speaking symptoms. Repeating an old psychoanalytic truth, Jean-Bertrand Pontalis advises readers “to exercise the ear [to grasp] the anomalies of discourse: it is from there that truth sends us a signal.”⁵⁰ Anomalies are frequent in the technical discourse on reinforced concrete and especially in its application. Let us take the mushroom slab as an example. The continuous slab—supported by isolated columns, with capitals as the only interposition and whose formwork raises no difficulty—is a convenient option for reinforced concrete.⁵¹ It was adopted by the greatest: by Baudot on his fantasy project *Grand espace couvert éclairé par le haut* (1914), where ribbed columns followed supporting membranes of the ceiling; by Maillart on the Giesshübel warehouse in Zurich (1910); later, by Frank Lloyd Wright on the Johnson Wax headquarters (1936); not to mention the variation by Antoni Gaudí in Park Güell (1900–1910). But the mushroom slab had almost no follow-ups, just a few resurgences called for by the most demanding designers: at the Gatti wool factory (1951), where Nervi employed mushroom pillars associated with ribbed slabs arranged according to the isostatic lines of the main bending moments (in fact, a low-cost prefabricated ensemble), or at the grandstand of the Zarzuela Hippodrome in Madrid (1941), where Torroja combined them with concrete membranes. Torroja was puzzled: “It has never been explained why the haunched beam is so repugnant today to the aesthetic sensibility of the architect, since for many centuries he was so delighted in using it in the form of carved putlogs or of brackets of stone which, beneath the supports of the beams, were always adorned with ornamentation impressive in its magnificent complacency.”⁵²

What we are facing here is an anomaly, a clash of determinations, as with every symptom. The modern division of labor in manufacture imposes a strict separation of production teams; those who make the skeleton are not the ones who erect walls. The distinctly rectilinear form is better suited to the discontinuous succession of separated teams, as I have already noted. Capitals, especially if curved as in mushroom slabs, imply special operations to adapt the walls to the break of orthogonality. That is why this kind of slab has been avoided, despite being most appropriate for concrete. But there are inconsistencies. First, because the logic of construction is rarely respected: on the contrary, techniques of domination require productive irrationality to hinder any reaction against them. Second, because if the logic of construction as a manufacture were the main determinant, walls and skeleton would be completely separated, as in some early projects by Oscar Niemeyer (Pampulha, 1943), and then the teams would have complete operational autonomy. The foregoing reasons for avoiding the mushroom slab would disappear. Nonetheless, it has not been adopted. In the tidal wave of

50 Jean-Bertrand Pontalis, *Après Freud* (Paris: Gallimard, 1968), 45.

51 Eduardo Torroja, *Philosophy of Structures*, trans. J. J. Polivka and Milos Polivka (Berkeley: University of California Press, 1958).

52 Ibid., 193.

cross-determinations, the modernist interdiction of any disregard for the imperative of orthogonality (postmodernism disregarded it, spoiled as an obnoxious *enfant gâté*) commands even where it should not. It has become a habitus of construction intended for producing surplus value and has infiltrated all stages of its development.

In this type of collision, various determinants are shuffled in contradictory ways. The first and oldest is the critical and by no means natural separation between design and realization. The intrusion of capital was the separation’s historical cause, and it was required by techniques of domination that complemented the prime subordination at the heart of the sale of labor power to capital. But this separation was only the first step. Separated design, already marked by separation, returned to the construction site as an expression of capital’s imperative and heteronomous will, a precondition for making its subordination effective. The heteronomous will required a design that was incomprehensible to the collective worker (the ensemble of workers conveniently divided and only copresent under the tutelage of capital); if it were comprehensible, there would be no subordination—either for objective reasons (constructive inconsistencies) or subjective ones (symbolic schemes out of the workers’ reach). Under such conditions, the communication of the design to the construction site, periodically made by the heir of the medieval *parlier* (the site foreman at that time), had to go through the mediation of rigid and univocal codes that, as any mediation, ended up imposing their internal constitution on what they should only mediate. Paradoxically, the mediating apparatus (drawings and other prescriptive documents) insinuated itself into the mediated terms and finally imposed itself as a secondary source of domination. As such, it returned to its origin (the will to dominate) and was soon transfigured into so-called aesthetics, which, like any ideology, were raised to the level of generic truth—*The Aesthetics*. These to-ings and fro-ings, as I have just outlined them here, obviously generated several inconsistencies that can be described only on a case-by-case basis.

7.

The republican government always presented major strikes as a threat. That is how it called upon the provincial troops in 1898 to counter the construction strikers in Paris. It is true that strikes were becoming more and more massive at the same time that revolutionary syndicalism was gaining momentum. Historians counted 4.6 million man days of strike in 1902, particularly in the building sector.⁵³

During its congress at Amiens, in October 1906, [the CGT] voted in favor of direct action, following the old slogan of the International:

53 Michèle Riot-Sarcey, *Le procès de la liberté. Une histoire souterraine du XIXe siècle en France* (Paris: La Découverte, 2016), 290.

“The emancipation of the working classes must be conquered by the working classes themselves.” In this perspective, the general strike . . . became the supreme means of emancipation for the proletariat. As workers conquered the instruments of production, block by block and factory by factory, the trade union would turn from a resistance group into a group producing and distributing goods, without the need to seize the state apparatus.⁵⁴

In summary, with the emergence of reinforced concrete, the separation between design and realization entered a new, exacerbated phase. The replacement of stone and wood aimed to drastically intensify formal subordination so that it served as a substitute for real subordination (which is unlikely in construction). It was impossible to strengthen formal subordination in the crafts of timber and stone because the knowledge and know-how implied in these crafts were in the hands of craftsmen, the core group of the CGT in the most combative period of revolutionary syndicalism. What is more, the traditional construction sector had an exemplary combative discipline in general, sectoral, and solidary strikes, and also in gathering shock troops against repression and against strikebreakers. Although the construction strike of 1911 was not victorious, it became a model of radical struggle and paved the way for the general revolutionary strike announced by the CGT. The construction strike scared capital’s entrepreneurs once and for all, especially as it had been directed against labor conditions. For these reasons, it became crucial to put an end to the crafts that were loaded with a history of struggles at the construction sites and to disarm the traditional stonecutters, masons, and carpenters who by then led the CGT and promoted its plan of a general revolutionary strike. Concrete was the material available to eliminate stone and wood, and along with them, the crafts that made use of these materials. Despite being a fledgling material unknown in numerous ways, concrete was summoned for immediate combat. While still in gestation, the material to sabotage the workers’ resistance entered the construction site to replace the crafts and the craftsmen that had been or were to be withdrawn.

Of course, to begin with, as is often the case with technical substitutions, concrete followed and adopted the formal sphere and knowledge associated with the materials it replaced. Not that the workers’ know-how was adopted, for this had been condemned to disappear or confined to the exile of a *compagnonnage* serving prestigious restorations. Instead, it was the “business know-how,” a collection of recipes and disjointed fragments of knowledge, which had until then informed the prescriptive side in its effort to command the “how” in wood and stone. There was something of a rush to import the workers’ know-how (aided by the emerging areas of materials science and structural analysis) and translate it into service orders, with the distant prospect on the horizon of dismissing, once and for all, this same know-how.

54 Steiner, *Le temps des révoltes*, 7–8.

Concrete was summoned for immediate combat.

However, there was not enough time to achieve that, and the monopolizable crafts continued to back up rebellion, strikes, and revolutionary projects. Given the urgency of the situation, “business know-how” provided its usual templates for the treatment of the new material. The result has been described above: the formatting of concrete for strictly substitutive functions. The way it was to be used, the calculation standards, and the mode of representation carelessly mimicked those of stone and timber. Even what was considered a novelty born of the use of concrete—namely, the “skeleton”—was in fact an old architectural practice, at least in northern France, known as *colombage*, or half-timbering. Therefore, it was an exponential, squared substitution: of the material and its uses and customs. That is why, at first, reinforced concrete used borrowed clothes, of a size far smaller than suited it. Unconsciously, its role was reduced to a contingent one: that of a mere saboteur in the service of injustice without positive content; an incarnation of the mediation of absolutized prescription; authoritarian design enslaved by real subordination. Only much later would concrete find its own “style”: brutalism.⁵⁵

Orthogonal, sign of the spirit.

On January 4, we were talking with my great friend Élie Faure:

Of course, to which level of nonsense have we sunk! The straight line, the right angle, sign of the spirit, order, control, are considered brute and primary manifestations. That they vilify: American!

This sign +, that is to say, a line cutting another line making four right angles, this sign that is the gesture of human consciousness, this sign that we draw instinctively, a graphic symbol of the human spirit: creator of order. This graph to which—by what intuitive way?—we gave the meaning of plus, positive, addition, acquisition.

Constructor sign.⁵⁶

55 Read, but between the lines: Jacques Sbriglio, ed., *Le Corbusier et la question du brutalisme* (Marseille: Parenthèses, 2013).

56 Le Corbusier, *Quand les cathédrales étaient blanches*, 61. Translators’ note: This chapter is not included in the English edition, published as *When the Cathedrals Were White: A Journey to the Country of Timid People*, trans. Francis Edwin Hyslop (New York: Reynal & Hitchcock, 1947).

Le Corbusier often leaves his structures visible, particularly in his texts. One could not unwittingly be more explicit. He pertinently evokes the power of the mists of reason—or intuition—in the two universes in which the structure of the symbolic network is extremely determining: in the drawing and in language, in that order.

Translated from the original Portuguese by Alice Fiuza and Silke Kapp.

Translators' note: The present English translation is based on an unpublished Portuguese original, finished in 2017, which substantially expands and elaborates on ideas discussed by Sérgio Ferro in earlier publications with similar titles: "Le béton comme arme," *Dessin/Chantier* 1 (1980); "O concreto como arma," *Projeto* 111 (1988); and "Le béton comme arme," in *L'Esprit des matériaux, architecture et philosophie no. 1: Béton(s)*, ed. Vincent Michel (Bordeaux: Edition de la Villette, 2009). In the original French and Portuguese texts there is a play between the term for reinforced concrete (*béton armé* or *concreto armado*) and the title "Le béton comme arme" or "O concreto como arma."

Sérgio Ferro is a Brazilian architect and painter. Ferro lived in exile for 30 years and spent a large part of this time in France, teaching at the Grenoble School of Architecture. From 1960 to 1970 he was a member of *Arquitetura Nova*, a radical architecture group that he formed with Flávio Império and Rodrigo Lefèvre. Ferro wrote extensively on architecture as the production of commodity, whose “modern” practices demanded a division of labor in order to generate the highest profits.

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