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Introduction

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¹ *The New Oxford Dictionary of English* (Oxford: Clarendon Press, 1998), p. 1108.

² Cf. François Béguin, "Savoirs de la ville et de la maison au début du 19ème siècle," in Michel Foucault (ed.), *Politiques de l'habitat (1800–1850)* (Paris: CORDA, 1977), pp. 211–324; here p. 306; Manfredo Tafuri, "Machine et mémoire: The City in the Work of Le Corbusier," in H. Allen Brooks (ed.), *Le Corbusier* (Princeton: Princeton University Press, 1987), pp. 203–18; here pp. 204–5; Georges Teyssot, *Die Krankheit des Domizils. Bauwelt Fundamente*, 87 (Berlin: De Gruyter, 1989), p. 52. In 1977, Georges Teyssot and Paolo Morachiello organized a conference in Venice that aimed under the title *Le macchine imperfette* to investigate the advent of modern architecture and its planning techniques. See Paolo Morachiello and Georges Teyssot (eds.), *Le macchine imperfette: Architettura, programma, istituzioni, nel XIX secolo* (Rome: Officina Edizioni, 1980).

³ Adolphe Lance, "Traité d'architecture par M. Léonce Reynaud," *Encyclopédie d'architecture*, vols. V/VI/VII (1853), pp. 33–7/47–53/62–9; here vol. VII, p. 68.

If a machine is an "apparatus using or applying mechanical power and having several parts, each with a definite function and together performing a particular task" ¹ then it stands to reason that a building is not a machine. Nevertheless, it need not be pointed out that the machine has long since carved out a successful career for itself in architecture. A number of architectural historians have referred over the last 40 years to that brief passage in the *Encyclopédie d'architecture* in which, probably for the first time ever in an official context, which is to say, in a specialist journal, mention was made of architecture as a machine. ² Adolphe Lance, an architect and then chief editor of the *Encyclopédie*, used the metaphor in his lengthy critique of Léonce Reynaud's *Traité d'architecture* in order to draw attention to certain machinic characteristics of architecture, which, he claimed, had hitherto been neglected in architectural theory, despite a growing awareness among the general public of how science and industry were profoundly influencing architectural practice. ³ That this omission was soon to be remedied is common knowledge. In the work of architects such as Eugène Emmanuel Viollet-le-Duc, Le Corbusier, Richard Buckminster Fuller, Alison and Peter Smithson, Kishō Kurokawa, and Rem Koolhaas, the term not only outlived historicism, modernism, and postmodernism, but also swept across North America, Europe, and Japan, and thereby anchored itself firmly in the vernacular of the last 150 years. The writer Émile Zola used it with the same ease as later the cultural historian Lewis Mumford, the psychoanalyst Félix Guattari, and, more recently, the philosopher Peter Sloterdijk. In the meantime, it appears that we have come to be surrounded by rather too many than too few machines—machines for living, concrete and abstract machines, zero-degree machines, emotion machines, defective machines, desiring machines, infernal machines, or energy machines.

If the topic of architecture/machine is addressed here, then not only in order to gain clarity within this diversity but also, and not least, with a view to forging new prospects in a dual sense: on the one hand, to broaden the cultural-historical and theoretical parameters of contemporary thought on technology in architecture such as is conveyed by the term machine, and thus also to radically challenge its increasingly alleged technocratic determinism; and, on the other, to trace the history and theory of architecture back to one of the major issues in architectural practice, the far-reaching implications of which have with few exceptions been largely ignored in recent years. This is all the more astonishing given that anyone seeking to sum up the architecture

of the last century in a single word would probably have to resort to using "machine." Several strands of this machinic history of architecture can be distinguished.

1 It is not that machines failed to feature in the architectural context prior to Adolphe Lance's statement of 1853. On the contrary, talk of machines is ubiquitous in the classical tracts on architecture. In the first volume of his *Ten Books on Architecture*, Vitruvius distinguishes three subsections of architecture—the execution of buildings, horology, and the construction of machines—before devoting the tenth volume exclusively to the last of these. There, he defines machines as "a combination of timbers fastened together, chiefly efficacious in moving great weights." Machines, Vitruvius continues, are distinct from tools on account of the number of laborers involved in their operation. Elsewhere, he ascribes mechanical status to revolving theater stages and military equipment.⁴ Indeed, since antiquity, the Latin *machina* has connoted not only operational machines in today's sense of the term but also static constructions, such as scaffolding, easels, or siege towers. In fact, the latter meaning prevailed in medieval times and resonated still in the eighteenth century, when it came to include all things imposing, bulky, or purposefully laid out, such as church spires, obelisks, paintings, or even theater plays. It was only in conjunction with a new reading of Vitruvius's texts by savants and architects such as Leon Battista Alberti and Georgius Agricola that the modern notion of machines as gearing mechanisms and work engines began to gain currency around 1500.⁵ In regard to construction one can therefore find Vitruvius's understanding of the machine practically unchanged in the late eighteenth century: even as the Industrial Revolution began fuelling advances in technology, manufacturing, and science, Jean-Baptiste le Rond d'Alembert spoke of machines in this sense in the ninth volume of his *Encyclopédie* of 1765: as wooden structures designed for the movement of loads.⁶

⁴ Vitruvius, *The Ten Books on Architecture*. Trans. Morris Hicky Morgan (Cambridge, MA: Harvard University Press, 1914), pp. 16, 283, 150, 303–19.

⁵ Cf. Marcus Popplow, "Die Verwendung von lat. *machina* im Mittelalter und in der Frühen Neuzeit – vom Baugerüst zu Zoncas mechanischem Bratenwender," *Technikgeschichte*, 60 (1993), pp. 7–26; Peter Friess, *Kunst und Maschine: 500 Jahre Maschinenlinien in Bild und Skulptur* (Munich: Deutscher Kunstverlag, 1993), pp. 16–24.

⁶ *Encyclopédie ou Dictionnaire raisonné des sciences, des arts et des métiers*, vol. 9 (Paris: Briasson, 1765), p. 798. A large part of the entry is adopted from Ephraim Chamber's *Cyclopaedia: or, An Universal Dictionary of Arts and Sciences*, vol. 2 (London: James and John Knapton, 1728), pp. 478–9.

⁷ *Encyclopédie méthodique. Architecture*, vol. 2 (Paris: Agasse, 1820), pp. 645–6.

2 That the ensuing and comprehensive mechanization of the environment from the late eighteenth century on—in agriculture, transport, and manufacturing—wrought radical and far-reaching changes in architecture can be called to mind here only briefly. Architectural theory was in any case slow to respond. When Quatremère de Quincy noted in the architecture volume of his *Encyclopédie méthodique* of 1820 that "architecture, because of its numerous relations, is the art that implements the biggest number of machines," he was still thinking mainly of construction machines,⁷ despite the ever-growing number of machines being

put into operation inside buildings at that time: devices to supply gas or water, apparatus such as lifts or bell pulls, and means of heating, cooling, or ventilating air. It was only in the second half of the century that architectural literature began to consistently address the machine. For instance, an early volume of the *Handbuch der Architektur* of 1881, one of the last comprehensive studies of architecture to be published, is devoted to *Services to Supply Buildings with Light and Air, Warmth and Water*, that is, to the numerous mechanical systems to have permeated the building industry in the foregoing century, and thus definitively incorporates them in the architectural realm.⁸

⁸ *Dictionnaire de l'Académie française*, vol. 2 (Paris: Firmin Didot Frères, 1835); *Anlagen zur Versorgung der Gebäude mit Licht und Luft, Wärme und Wasser. Handbuch der Architektur*, part 3, vol. 4 (Darmstadt: Diehl, 1881). For general accounts of the technification of architecture see Pedro Guedes (ed.), *Encyclopedia of Architectural Technology* (New York: McGraw-Hill, 1979); Cecil D. Elliott, *Technics and Architecture: The Development of Materials and Systems for Buildings* (Cambridge: MIT Press, 1992).

⁹ Gilbert Simondon, *Du mode d'existence des objets techniques* (Paris: Aubier, 1989 [1958]), p. 21. Simondon does not describe the transformation of architecture in this passage, but the evolution of the motor. The analyzed process of individuation nevertheless seems to be appropriate to the realm of architecture.

¹⁰ Jacques Lafitte, *Réflexions sur la science des machines* (Paris: Vrin, 1972 [1932]), pp. 24–5, 67–70. Simondon resorts to Lafitte's classification in his lectures at the Sorbonne and the Ecole Normale Supérieure (1968–1969), amongst others. Cf. for example Gilbert Simondon, *L'invention dans les techniques: Cours et conférences*. Ed. Jean-Yves Chateau (Paris: Seuil, 2005), pp. 170–93.

¹¹ Lance, "Traité d'architecture" (see note 3), vol. VII, p. 68.

The scope of these technical interventions was initially quite limited. Each individual device originally has a life of its own and the technical object in its early domestic manifestation may be described as abstract. It leads an independent existence and functions according to its own internal logic, regardless of its context or neighbors. Above all, it is independent of the space-defining shell construction into which it settles or whose tectonic borders it penetrates. Yet, little by little, it transforms the built structure into a mechanical ensemble, the distinct parts of which have hence to be coordinated not so much by way of compromise as on account of their simultaneity.⁹ From here, it is only a small conceptual step to seeing architecture as an integral part of a universal "mécanologie," as the French architect and engineer Jacques Lafitte shows in his essay of 1932, where he defines architecture—in contrast to the "natural" or "raw bodies"—as an "organized body" and matter-of-factly assigns it to the category of (passive) machine.¹⁰

3 The examples and trajectories introduced above are ambiguous insofar as the borders between the machine—as a concrete apparatus, a device, or a gadget—and the machine analogy tend to blur. When Lance writes of architecture machines in 1853 he mentions neither construction equipment, nor the equipment used to survey or portray architecture, nor even explicitly the countless infrastructural innovations increasingly shaping the architecture of his day. Remarkably, he demands instead that the house itself be regarded henceforth as an instrument, as a machine, so to speak: one that not only serves to shelter man but also, whenever possible, subordinates itself to his needs, supports his activities, and multiplies the fruits of his labor.¹¹ As Lance suggests (and his successors' positions echo), the notion of the machine is not so much a reference to the nascent mechanization of the house itself around 1850—and the attendant systematic approach to issues of heating, cooling, and

ventilation – but, rather, a means to describe architecture in terms of its overall performance, which can henceforth be assessed in terms of its efficiency and planned accordingly.

The machine metaphor has a history of its own. From antiquity on, machine analogies permeate such diverse fields as cosmology, physiology, and politics, in the service of a general description of operative divine or human creations. In the Middle Ages, in keeping with the term's then primarily (yet often overlooked) static connotations, its metaphorical use most often emphasizes the stability of a composite object, be this the world (as in *machina mundi*), the body (as in *machina corporis*), or an architectonic structure.¹² It is the technical and cultural developments of the Early Modern period that pave the way to the modern notion of the machine, preparing it to serve as an image for complex, dynamic, and productive entities as well as predetermined, regulated processes – as, for example, in the now kinetic “world machine.”¹³ However, apart from certain singular and specific exceptions, it is only in the nineteenth century that machine metaphors begin to spread in the discourse of architecture.¹⁴ The publication of Lance's article around 1850 may therefore be regarded as a crucial shift. The industrialized economy has so altered living conditions and machine concepts as to provide now a role model, also for architecture.¹⁵ Yet even Lance remains hesitant. “If you'll please excuse this bizarre metaphor,” he writes, “our house is the factory in which we produce the myriad acts of our private life.”¹⁶

4 If in architecture the machine analogy emerges fully only in the mid-nineteenth century, one must inquire not simply into the exact nature of the problems it conveys, but also into the terms hitherto used by architects and historians of architecture to describe similar issues. Here too, Lance provides insight: “Might it not be possible,” he asks, “to regard buildings in the light of something other than their disposition and distribution?”¹⁷ He thus shifts the focus from the arrangement of spaces within a building – *disposition* – and the internal

¹² For a general historical account of the machine notion and metaphor, see *Historisches Wörterbuch der Philosophie*, vol. 5 (Basle: Schwabe, 1980), pp. 790–802. To document the use of “stable” machine expressions in construction, Popplow cites the twelfth-century author Honorius of Autun: “It is better to have the whole machine of the house carried by one marble pillar than to spread its entire load over one hundred supporting canes.” (Trans. by the authors). Popplow, “Die Verwendung von lat. *machina*” (see note 5), p. 14.

¹³ Cf. Popplow, *ibid.*, pp. 20–1; Hans Holländer, “Maschinen- und Labyrinthmetaphern als Topoi neuzeitlicher Weltbeschreibung,” in Holländer, (ed.), *Erkenntnis, Erfindung, Konstruktion: Studien zur Bildgeschichte von Naturwissenschaften und Technik vom 16. bis zum 19. Jahrhundert* (Berlin: Gebr. Mann, 2000), pp. 577–86.

¹⁴ *Historisches Wörterbuch der Philosophie* (see note 12), pp. 797–800.

¹⁵ Lance, “*Traité d'architecture*” (see note 3), vol. VII, p. 68 (Trans. by the authors).

¹⁶ *Ibid.*

¹⁸ Ibid. For the terms *disposition* and *distribution* cf. *Dictionnaire de l'Académie française*, vol. 1 (see note 8), pp. 561, 566.

¹⁹ Cf. on this, particularly Jacques Guillerme, "À propos du concept de rendement," in Jean Rostand (ed.), *Actes du XIIe congrès international d'histoire des sciences*, vol. 4 (Paris: Blanchard, 1971), pp. 82–7.

²⁰ Cf. on this Adrian Forty, who makes similar links with the term "circulation." Adrian Forty, "Spatial Mechanics—Scientific Metaphors," in *id.*, *Words and Buildings: A Vocabulary of Modern Architecture* (London: Thames & Hudson, 2000), pp. 86–101; here p. 90.

²¹ Liane Lefaivre and Alexander Tzonis, "The Machine in Architectural Thinking," *Daidalos*, 18 (1985), pp. 16–26, and also Lefaivre and Tzonis, "The Mechanization of Architecture and the Birth of Functionalism," *VIA*, 7 (1984), pp. 121–43.

²² Lefaivre and Tzonis, "The Machine in Architectural Thinking" (see note 21), p. 25.

²³ See Thomas Brandstetter, *Kräfte messen: Die Maschine von Marly und die Kultur der Technik 1680–1840* (Berlin: Kadmos, 2008).

²⁴ Michel Foucault et al. (eds.), *Les machines à guérir (aux origines de l'hôpital moderne)* (Paris: Institut de l'environnement, 1976). A revised edition was published in Belgium shortly afterwards (Brussels: P. Mardaga, 1979).

²⁵ Anthony Vidler, "Confinement and Cure: Reforming the Hospital, 1770–1789," in Vidler (ed.), *The Writing of the Walls: Architectural Theory in the Late Enlightenment* (Princeton: Princeton Architectural Press, 1987), pp. 51–72; here p. 61; Robin Middleton, "Sickness, Madness and Crime as the Grounds of Form," *AA Files*, 24 (1992), pp. 16–30; 25 (1993), pp. 14–29; here 24, p. 20.

²⁶ Jacques René Tenon, "Lettre à Messieurs de l'Académie des sciences de Pétersbourg," September 11, 1788, Bibliothèque nationale de France, Paris, Nouvelles Acquisitions Françaises 11357, fol. 129–30.

division of a building in accordance with its various purposes—*distribution*—to the "économies de temps et de forces." ¹⁸ In other words, Lance turns the spotlight on architecture's capacity to engage in temporal and physical processes. Unlike in earlier writings, economy now concerns not only the building itself but also all the movement within it, the flow of which is regulated, ordered, and modulated according to the imperative of efficiency. ¹⁹ That which is first described in Lance's work by the machine analogy is thus a dimension of architecture that transcends its materiality: its capacity to perform. ²⁰

Lance lays down a precise technical terminology for the idea of efficiency in architecture, the origins of which can be traced back to the seventeenth century, when it crops up first in military architecture and then, later and more universally, in connection with the construction, statics, and material properties of buildings in general. ²¹ Yet it is in the context of late-eighteenth-century debates in France about the hospital building as a "curing machine" that its concrete architectural as well as conceptual implications truly leave their mark, for only here does the idea of the machinic extend "beyond the material fabric into problems of space allocation and the arrangement of activities." ²² In this respect the architectural realm is no exception to the broader cultural trends of the day, wherein a shift from the "substantial" to the "functional," which is to say, effective notion of the machine can be noted from around 1800. ²³

Following the publication of a landmark study in 1976, "curing machine" becomes a kind of catchall term in the architectural historiography of the eighteenth and nineteenth centuries, ²⁴ with the tenor to suggest the juxtaposition of a traditional reading of architecture and the cold rationality of a mechanism. ²⁵ Yet the relevant sources actually do not refer to a "machine à guérir," nor even to a straightforward "machine," but to "machines de physique" ²⁶ —in the eighteenth century a common term for laboratory apparatus or equipment. The physician Jacques René Tenon uses this term to describe the architecture of a hospital

not in a directly utilitarian or productive context, but as part of a trial procedure, which—although serving a specific purpose—has no predetermined outcome. What he thereby expresses is not so much the idea of deterministic automation as that of an operative entanglement, in the sense of a new form of alignment between the architectural object and the epistemic procedure of healing.

5 While, in the debate on hospitals, the term “machine” applies to the ground plan and spatial dimensions and, in Lance’s text, further encompasses the ability of architectural elements or installations to adapt to their user’s daily actions, for Viollet-le-Duc, a few years later, it connotes the mechanical interplay of construction elements that constitute, once combined, a functional entity.²⁷ Le Corbusier, for his part, in the opening decades of the twentieth century, famously foregrounds the instrumental character of built objects: the house as a “machine à habiter,” the chair as a machine for sitting, or the temple as an emotion machine.²⁸ The “air machinist” Le Corbusier conjures is characterized not so much by the particular technological stage of development of the objects of reference—for they are primarily pre-industrial artifacts—but, more emphatically, by the ubiquity of these objects in his imaginary.²⁹ For Reyner Banham, who first critiques this position of Le Corbusier in the 1950s, the machine eventually comes to concern the issue of climate³⁰ while Nicholas Negroponte shortly afterwards begins to open up a new line of interpretation in his computer-based research on “architecture machines” at MIT.³¹ Kazuo Shinohara, by contrast, in his machine metaphors of the 1970s, 80s, and 90s, references Gilles Deleuze’s and Félix Guattari’s desiring machine, whereas Guattari develops a short theory of the architectural machine in reference to the buildings of Shinohara’s compatriot Shin Takamatsu.³²

Indeed, it is this considerable flexibility that distinguishes the machine analogy in architecture over the last 250 years or so: the comparative instances change and likewise the terms used to explain the machine metaphor, which range

29 Machinic terms and references have been used to address aesthetic issues in architecture at least since the mid-nineteenth century. For an early example, see Horatio Greenough, “American Architecture” (1843), in Greenough, *Form and Function: Remarks on Art, Design, and Architecture* (Berkeley: University of California Press, 1947), pp. 51–68.

27 Eugène Emmanuel Viollet-le-Duc, *Discourses on Architecture* (Boston: James R. Osgood, 1875 [1863]), p. 186. Cf. on this Jacques Lucan, *Composition, non-composition: Architecture et théories, XIXe–XXe siècles* (Lausanne: Presses polytechniques et universitaires romandes, 2009), pp. 268–71.

28 Le Corbusier’s proposition found an early formulation in 1911 in the description of the Parthenon as a “terrible machine,” cf. Ivan Zaknić (ed.), *Journey to the East: Le Corbusier (Charles-Edouard Jeanneret)*. Trans. Ivan Zaknić (Cambridge: MIT Press, 1987), p. 212. Corbusier’s first known use of the expression “machine à habiter” is in the article “Maisons en série,” *L’Esprit Nouveau*, 13 (1921), pp. 1525–42; here p. 1538. It is further elaborated in *Vers une architecture* (1923). Shortly after Le Corbusier, Walter Gropius likewise took up the notion. Cf. the manuscript “Wohnmaschinen,” February 6, 1922, Bauhaus-Archiv, Berlin, 19/694.

30 See Reyner Banham, “Machine Aesthetic,” *The Architectural Review*, 117 (1955), pp. 225–8; Banham, *The Architecture of the Well-Tempered Environment* (London: The Architectural Press, 1969).

31 Nicholas Negroponte, “Toward a Theory of Architecture Machines,” *Journal of Architectural Education*, 23, no. 2 (1969), pp. 9–12; Negroponte, “Aspects of Living in an Architecture Machine,” in Nigel Cross (ed.), *Design Participation: Proceedings of the Design Research Society’s Conference* (London: Academy Editions, 1972), pp. 63–7.

32 Cf. exemplarily Kazuo Shinohara, “When Naked Space is Traversed,” *The Japan Architect*, 228 (1976), pp. 64–72; Shinohara, “The New Machine: Absorbing Chaos,” *Columbia Documents in Architecture and Theory*, 1 (1992), pp. 135–45; Félix Guattari, “Les machines architecturales de Shin Takamatsu,” *Chimères*, 21 (1994), pp. 127–41. On relations between Guattari, Shinohara, and Takamatsu, see Simone Brott, *Architecture for a Free Subjectivity: Deleuze and Guattari at the Horizon of the Real* (Farnham: Ashgate, 2011).

from "laboratory apparatus" to "manufacture," from "factory" to "tool," or, later, from "vehicle" to "computer." At least three different general models can be distinguished here, namely the mechanically propelled, the thermodynamically powered, and the cybernetic machine: three models distinguished by their different types of motion or motor, namely the vectorial, the transformative, and the informational.³³ The field is rendered yet more complicated if one includes the organic analogy, the history of which has long been deeply entangled with that of the machine. It is only with the rise of vitalism in the mid-nineteenth century that the model of the organic develops its thoroughly own, non-mechanistic explanatory power and even then it often remains in close dialogue with technical schemes.³⁴ Essentially, these various models are not mutually exclusive. They can be regarded neither as a sequence nor a development curve, since they are able to co-exist. Le Corbusier simultaneously references the tool and industrial enterprises. For Negroponte, the "architecture machine" is simultaneously a design technology and an inhabitable structure. Shinohara takes "machine" to refer to constructions of parts as well as to the transversalities of space. One and the same analogy thus gives rise to different instances of comparison.

6 Whatever the machine's type of operability and semantic nuance (mechanical, aesthetic, climatic, electronic, etc.), the overriding characteristic of the architecture-as-machine concept is the fact that it describes certain kinds of performance. The word performance must be understood here in its original sense, where it refers to the realization and the execution of a task, and more specifically, to the results achieved, as well as in its current theoretical sense in the field of science and technology, where it refers to the competence, the capabilities, or the effectiveness inherent to persons as well as to things.³⁵ From this perspective, architecture is not merely an inert artifact but also, by its very materiality, influences the behavior of its users, and prescribes certain human activities. It is anthropomorphic, not only because it is man-made and substitutes human activities, but also, and above all, because it shapes the actions and at times also the bodies of its users.³⁶ Somewhere between comfort strategies, disciplinary measures, and instances of control, the user is written into the machine's program, be it as the typified body of the industrial age or the fragmented body of the information age. The "mechanization" of architecture therefore does not isolate the material aspects of the building project from human relations.³⁷ Inversely, man is part of the

³³ Michel Serres, *Hermes IV: La distribution* (Paris: Édition de Minuit, 1977), pp. 43–62.

³⁴ See Joseph Rykwert, "Organic and Mechanical," *Res*, 22 (1992), pp. 11–18; Georges Canguilhem, "Machine and Organism," in Canguilhem, *Knowledge of Life*. Trans. by Stefanos Geroulanos and Daniela Ginsburg (New York: Fordham University Press, 2008), pp. 75–97.

³⁵ Historically, cf. *The Oxford English Dictionary*, vol. 11 (Oxford: Clarendon Press, 1989), p. 544. Theoretically, cf. for example Andrew Pickering, *The Mangle of Practice: Time, Agency, and Science* (Chicago: University of Chicago Press, 1995).

³⁶ Cf. Jim Johnson [=Bruno Latour], "Mixing Humans and Nonhumans Together: The Sociology of a Door-Closer," *Social Problems*, 35, no. 3 (1988), pp. 298–310; here p. 303. "Machines are lieutenants; they hold the places and the roles delegated to them," Latour concludes. *Ibid.*, pp. 308–9.

³⁷ Cf. Lefavre and Tzonis, "Mechanization of Architecture" (see note 21), pp. 139–40.

architecture/machine: without him it cannot operate. At stake, for this same reason, are not only questions of technization or modernization, but instances of explication.

Indeed, the machinic in architecture is distinguished not only by the fact that it follows a certain program, triggers a certain process, or fulfills a certain procedure but also by its simultaneous revelation of the various determinants with which architecture is confronted, and the scope thus engendered for their modification, improvement, rejection, or re-design. Thus Le Corbusier describes the house as a "machine for living" in order to turn the spotlight on the unseen potential of the space and construction economies; Reyner Banham sees in the technical accomplishments of the modern "curtain wall façade" a chance to break down the classic load-bearing, protective, and insulating wall into its individual, independent, and functional components; and Peter Sloterdijk describes air-conditioning with its heating, cooling, humidification, and cleaning procedures as "an explication of the properties of air."³⁸ Accordingly, that which characterizes the technical device is not so much the technology underpinning its operation but rather the associated revelation of latencies and concealed procedures.³⁹ For here—and it is this which characterizes the machinic—"technical activity [becomes] a conscious operation that enters into a regulated relationship with the sciences [and] gains in coherence [whereby] technology becomes a theoretical issue."⁴⁰

7 Architecture machines are hence neither isolated nor autonomous. A further analogy is therefore called for. Lewis Mumford tried as early as 1934 in *Technics and Civilization*, and moreover in his later work *Myth of the Machine*, to define the cultural and social role of the machine and to distinguish between "machines" in the sense of concrete technical objects (among which he implicitly ranked architecture too) and "the machine," by which he meant a society's entire technical complex: in his view, a prerequisite of the former. Mumford stresses that this is no idle wordplay, but rather that a classic definition—for example, Franz Reuleaux's description of a machine as a combination of parts, specialized in function, operating under human control, and utilizing energy to perform a task—serves equally to characterize social constellations.⁴¹ This thesis was to have a profound and intricate influence on philosophical thought, particularly in France: when Deleuze and Guattari analyze the capitalist social order and the modern state as a "megamachine", or Michel Foucault famously goes on to describe disciplinary society through the spatial concept of the "panoptic machine,"⁴² their indebtedness to it is patent.

³⁸ Peter Sloterdijk, "Airquakes," *Environment and Planning D: Society and Space*, 27 (2009), pp. 41–57; Sloterdijk, *Schäume*, vol. 3: *Sphären: Plurale Sphärologie* (Frankfurt: Suhrkamp, 2004), pp. 501–67.

³⁹ Martin Heidegger, "The Question Concerning Technology," in Heidegger, *The Question Concerning Technology and Other Essays*. Trans. William Lovitt (New York: Garland Publishing, 1977), pp. 3–35; here pp. 16–17. Heidegger, however, was no friend of the concept of architecture-as-machine: "[It] is only a further sign of the prevailing groundlessness of thought and understanding today," he posited in 1929/30, "when we are asked to regard the house as a machine for living and the chair as a machine for sitting." Martin Heidegger, *The Fundamental Concepts of Metaphysics: World, Finitude, Solitude*. Trans. William McNeill and Nicholas Walker (Bloomington: Indiana University Press, 1995), pp. 215–16.

⁴⁰ Erich Hörl, "Die offene Maschine: Heidegger, Günther und Simondon und die technologische Bedingung," *MLN*, 123 (2008), pp. 632–55; here pp. 639–40 (Trans. by the authors).

⁴¹ Lewis Mumford, *Technics and Civilization* (London: Routledge, 1934), pp. 12, 41–5; Mumford, *The Myth of the Machine*, vol. 1: *Technics and Human Development* (London: Secker & Warburg, 1967), pp. 188–94.

⁴² Gilles Deleuze and Félix Guattari, *Anti-Oedipus*. Trans. Robert Hurley, Mark Seem, and Helen R. Lane (Minneapolis: University of Minnesota Press, 2000 [1972]), pp. 141–2; Deleuze and Guattari, *A Thousand Plateaus*. Trans. Brian Massumi (Minneapolis: University of Minnesota Press, 2005 [1980]), p. 428; Michel Foucault, *Discipline and Punish: The Birth of the Prison*. Trans. Alan Sheridan (New York: Vintage Books, 1995 [1975]), pp. 217, 309.

Deleuze again, reviewing *Discipline and Punish*, distinguishes even more clearly between concrete machines, such as the "machine-école," the "machine-hôpital," or the "machine-prison," and abstract machines; between the building with its concrete appurtenances, such as cells or rooms, and the diagram as an expression of the relations of force within the apparatus of power. The abstract machine is a machine inasmuch as it segments society in time and space: in the disciplinary society, on different levels; in the control society, by modulating flows.⁴³ Here, the signs are once again reversed. For it is generally supposed that the machine concerns a specific aspect of architecture, one that can be isolated and described, and to which certain functions might be assigned. Yet it could equally be argued that "the machine" or the "abstract machine" determines the preconditions. For the machine, per Deleuze, is social before it is technological or, as in the present case, architectural.⁴⁴

Concrete machines, machine models and analogies, machinic explications, and abstract machines—these are some of the key terms of reference by which the following essays proceed: in a historical framework that spans over 250 years; in an architectural framework, because our concern is the built artifact; and, not least, in a socio-political framework, because it is this which shapes preconditions for the former. The essays pursue various approaches to the machinic in architecture, in a sequence that traces a dual trajectory, thematic and chronological: thematic, inasmuch as we endeavor to address in this compilation a broad and diverse array of programs, performances, and processes; chronological, inasmuch as we presuppose them all to have, even if not necessarily a causal then a temporal relationship to one another.

⁴³ Gilles Deleuze, "Postscript on the Societies of Control," *October*, 59 (1992), pp. 3–7. On the machine concepts of Deleuze and Guattari, see Henning Schmidgen, *Das Unbewusste der Maschinen: Konzeptionen des Psychischen bei Guattari, Deleuze und Lacan* (Munich: Fink, 1997); Gerald Raunig, *Tausend Maschinen: Eine kleine Philosophie der Maschine als sozialer Bewegung* (Vienna: Turia + Kant, 2008).

⁴⁴ Gilles Deleuze, *Foucault* (Minneapolis: University of Minnesota Press, 2009 [1986]), p. 39.