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Nequiquam deus abscidit
prudens Oceano dissociabili
terras, si tamen impiae
non tangenda rates transiliunt vada.[1]

– Horace, *Odes*, 1.3.21–24

In one of the propositions of *Elements of the Philosophy of Right*, Hegel traces a very concise genealogy of European civilization, reducing it to a primordial conflict between land and sea forces. Whereas the former reflected the natural dependence of life on Earth, the latter corresponded to humankind's innate ingenuity and fortitude – on the one side, the stability of family orders and the foundation of cities, and on the other, the dynamism of industry and the uncertainty of sea trade. Land and sea mirrored the sedentary and nomadic character of the human species: if globalization began with the art of occupying, dividing, and inhabiting territories, then it advanced through the technical domination of the unknown, the survey and projection of the oceans' extension.[2]

For Hegel, the productive draw of the oceans stimulated cultural innovation and commerce, connecting distant countries through trade and contractual rights, but also preparing the ground for future empires. The geographic and scientific discoveries of the 15th century revolutionized the geometric constraints of previous global perceptions, unveiling unexplored territories through the Spanish, Portuguese, Dutch, French, and English maritime expeditions. In search of new lands and resources for extending their commercial power beyond the old continent, European nations surveyed the horizontal surface of the ocean and established the principles of an international jurisprudence.[3] As amity lines and abstract routes of sea trade replaced continental roads and walled cities, the heterotopic instability of the *ship* – a floating device able to tame the fluctuating order of the sea – gradually superseded the steady terrestrial paradigm of the *house* and its domestic rituals. Perhaps no nation in modern times violated Horace's *Oceano dissociabili* more persistently than England, an island nation as "continent" that successfully embraced the

1. "The wise God sundered / the lands with estranging Ocean in vain / since impious boats traverse / the sounds that ought to remain unstained." W.G. Shepherd, trans., *Horace: The Complete Odes and Epodes with the Centennial Hymn* (New York: Penguin, 1983).
2. "Further, the sea is the greatest means of communication, and trade by sea creates commercial connections between distant countries and so relations involving contractual rights. At the same time, commerce of this kind is the most potent instrument of culture, and through it trade acquires its significance in the history of the world." G.W.F. Hegel, *Elements of the Philosophy of Right*, ed. Allen W. Wood, trans. H.B. Nisbet (Cambridge: Cambridge University Press, 1991), 268, §247.
3. In *Land and Sea*, and even more extensively in *The Nomos of the Earth*, Carl Schmitt develops Hegel's propositions, characterizing the evolution of globalization through the concept of *nomos* – namely, the act of occupying, surveying, dividing, and cultivating land. See Carl Schmitt, *Land and Sea*, trans. Simona Draghici (1954; Washington, DC: Plutarch Press, 1997).

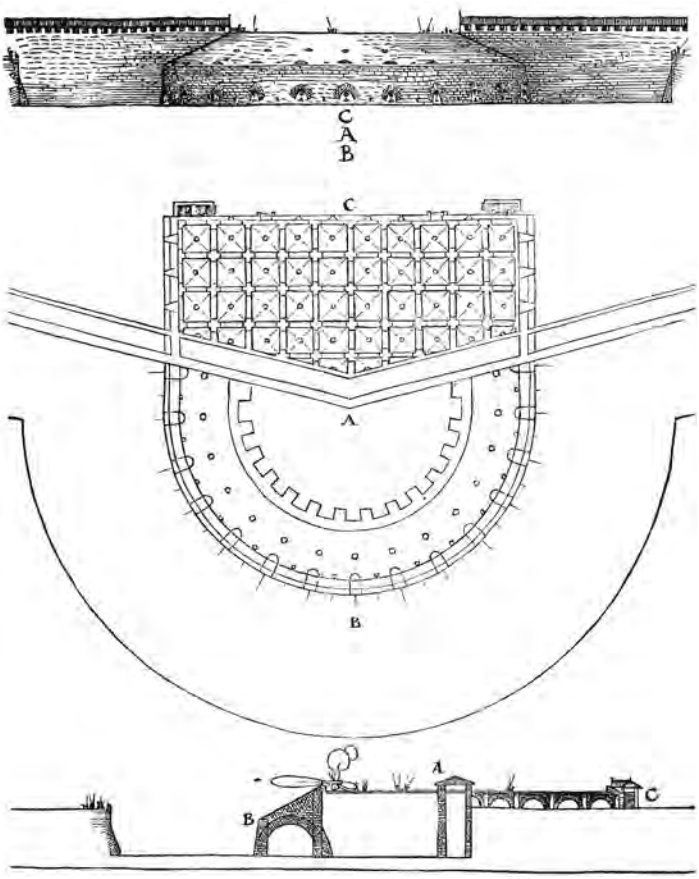
spatial revolution, moving its whole empire across the maritime domains of the western and eastern oceans. From this perspective, the highest affirmation of industry and technology could have emerged nowhere else but in England, developing first through naval warfare and ultimately deploying over land.

Logistics completed Hegel's trajectory. In the aftermath of World War II, land and sea coalesced into a unique territorial apparatus. Containerization, intermodal freight transport, and outsourced manufacturing processes established a global infrastructural system that regularized the circulation of goods and undermined local labor relations by imposing standardized spatiotemporal frameworks. As pallets and containers revolutionized the architecture of the harbor by allowing traditional stevedoring and docking tasks to become automated processes, so digital technologies and warehousing software transformed the way goods are measured, coded, and dispatched, progressively reducing architecture to colossal semiautomated sheds.

1. Art of War

The term *logistics* derives from the Greek verb *logizein*, meaning to calculate, to reckon, to organize rationally, to plan. Over time it acquired a military connotation, dealing not only with the composition, lodging, and movement of troops but also with the arrangement of provisions in hostile territories, as well as the transportation and storage of artillery, food, medicine, and fuel. Logistics also entailed the disposition of the battlefield, the construction of defensive systems and urban settlements, and the planning of infrastructure and communication networks.

Architecture is intrinsically logistic. Not by chance, the first Western treatise on architecture, Vitruvius's *De architectura*, was written by a soldier and carpenter for Julius Caesar. The treatise is a sort of compendium of Roman construction and military knowledge, the main principles of which are essentially logistic in nature: *ordinatio*, or the ordering of space according to quantity; *dispositio*, the regular arrangement of parts according to a whole; *eurythmia*, the proportions of inner parts in a plan; *symmetria*, the complementarity of the elements within a composition; *decore*, the proper conformity to customs, rules, traditions, and natural conditions; and finally *distributione* (what the ancient Greeks called *oikonomia*), the appropriate organization of site, building procedures, and expenses. Each of these principles found



Albrecht Dürer, elevation, ground plan, and cross section of an angled fortification, from *Etliche underricht zu Befestigung der Stett, Schloss unnd Flecken*, 1527.

direct application in the foundation of cities, which Vitruvius conceived as war machines laid out according to the protocols of military encampment: the procedure of the *castramentatio*, described by Polybius, offered a paradigm for the correct administration of the city and the state at large.[4] From the central crossing of streets and the outer delimitations of walls to the disposition of buildings based on topography and the wind's direction to the extraction and conveying of water, logistics was indispensable for channeling all the natural forces of a context through an ordered architecture, ensuring a healthy life for its inhabitants and defense in times of hostility.

The logistic nature of architecture is even more explicit in the last book of Vitruvius's treatise, which deals with mechanical apparatuses, military devices, and stratagems – or what he termed *machinatio*. Vitruvius considered architecture a discipline on the verge between speculation and fabrication, the application of materials and the rational understanding of their properties, a combination of practical knowledge and cunning intuition (*sollertia*).[5] What truly elevates men

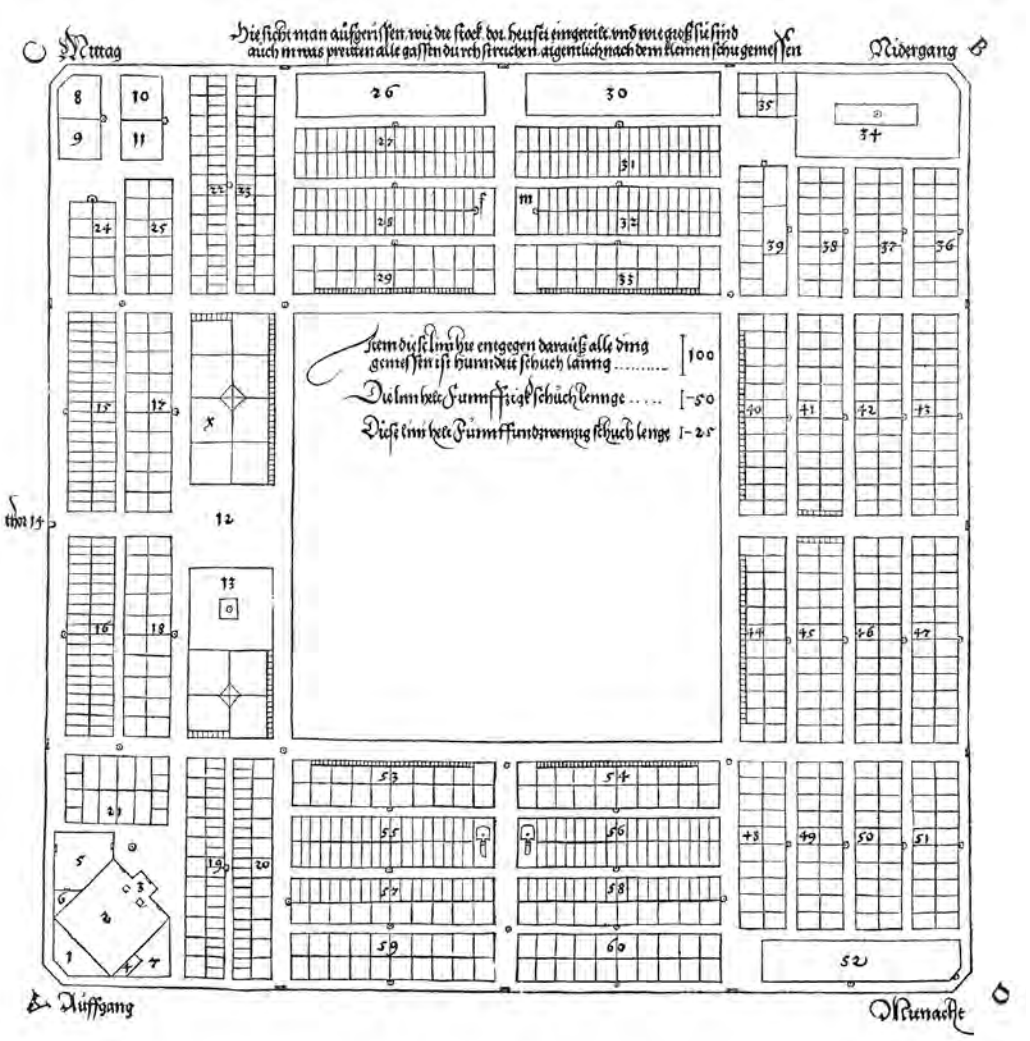
4. The term *castramentatio* derives from the Latin *castrorum metatio*, or "measurement of the camp." As Polybius narrates, the foundation of the encampment coincided with the marking procedure of the crossing point between the *cardo*, the north–south axis, and the *decumano*, the east–west axis, transferring the four polar divisions of the sky onto the earth. See Polybius, *Histories*, book 6.

5. Encompassing a mastery of juridical prescriptions concerning the minimization of building expenses, functional analyses of civil machines for transporting weights, drawing and conveying water, extracting materials, a general account of physical laws, and detailed explanations of attacking and defensive apparatuses, the Vitruvian *sollertia* could be conceived as the ability to project that, for Marx, distinguishes men from animals. See Vitruvius, *The Ten Books on Architecture*, trans. M.H. Morgan (New York: Dover Publications, 1960).

from a bare animal condition is the faculty for choosing and mentally planning actions in advance, the ability to *project*, to create instruments, and to distill the complexity of the world into finite forms of spatial, temporal, and cultural organization. Whether in taming the conditions of nature, in the midst of a conflict, or in a political dispute, the efficacy of human ingenuity, for Vitruvius, emerged always in moments of danger, when hostile conditions demanded prompt responses and tactics of survival. He saw the architect as a true "machinator," a strategist more than a technician, for he constructs the conditions and appropriate means to serve his imagination.[6] A plan is not dissimilar from an abstract machine insofar as it implies a rational ordering of reality according to the disposition and distribution of forces into measurable quantities: to project, *machinare* – that is, "to bend nature to our utility," as Daniele Barbaro translated it.[7] No illustrations of machines appear in *De architectura*, only detailed descriptions and sets of instructions, which could have been built and applied in any condition. Machines were schemes more than they were built models. What truly mattered were their dynamic principles, the modularity and proportions of their inner parts, rather than their effective shape, which might vary according to the resources available on site. This was essentially logistics.

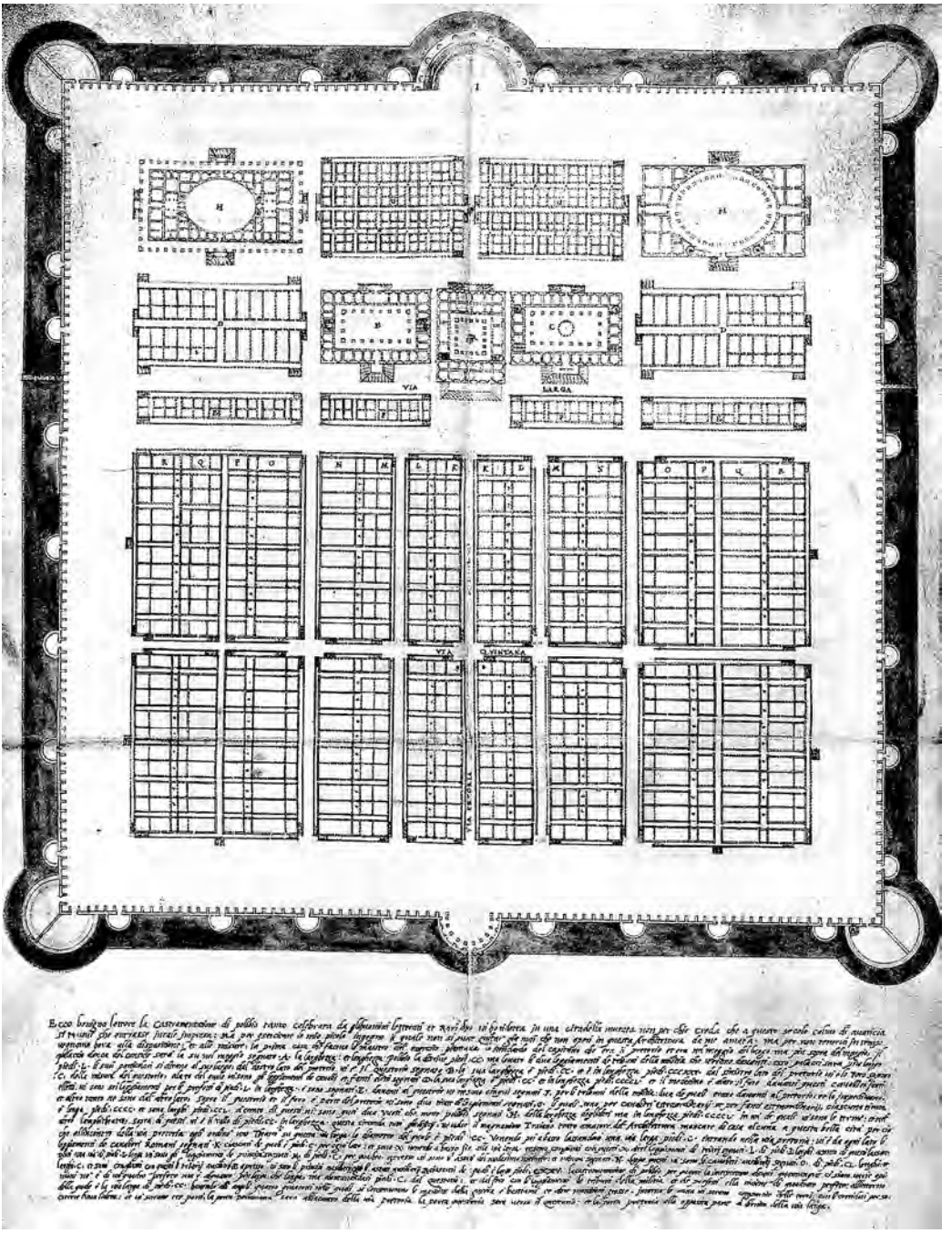
With the rediscovery and exegesis of the Vitruvian *machinatio* in the early 15th century, cities began to be investigated and planned as logistic apparatuses: mechanical assemblages of objects, people, and fluxes of commodities to be rationally controlled without recourse to any symbolic, allegorical, or mystical order. It was precisely at this moment that – with the development of the geometric sciences, the drastic demographic growth, and the global expansion of trade – mathematics supplanted craftsmanship and the world of the approximate, translating the traditional theme of the "ideal city" into a mundane paradigm and inscribing it within the abstract logic of exchange, management, distribution, and circulation. In order to extend its power over a territory, a flourishing 15th-century city needed a calculated defensive system, a faithful army, and the virtuous government of a prince able to administer the intestinal humors of the state and control the conquered dominions through efficient bureaucracy. In particular, the rapid evolution of artillery necessitated a swift, precise measurement of fire trajectories and an accurate survey of the opponent's defense, thus changing the form of battles and cities but also revolutionizing the way architecture was represented.

6. See Bernard Cache, "Vitruvius Machinator Terminator," in *Projectiles*, trans. Clare Barrett (London: Architectural Association Publications, 2011), 119–39.
7. Daniele Barbaro, trans., *Dieci libri dell' architettura di M. Vitruvio* (Venice, 1556), book 10. In Vitruvius's *De architectura*, the term *machina* found its first complete definition as a "coherent combination (*coniunctio*) of materials with the virtue of moving (*motus*) heavy loads." Yet its etymological origin could be extended back to the Greek *mechané* (or *mechós*), "means, expedient, remedy," and even further to the ancient Indo-European root *mahg-*, "that which enables," or more generally, "power" or "capability." *Magh-* is traceable in Latin words such as *magia* ("magic") and *magnus* ("great"), in the Greek *mèchos* ("trick"), and in the German *macht* ("force"). See Vitruvius, *De architectura*, 10.1.1; and Gerald Raunig, *A Thousand Machines: A Concise Philosophy of the Machine as Social Movement*, trans. Aileen Derig (Los Angeles: Semiotext(e), 2010), 36.



Albrecht Dürer, plan of a city in the form of a fortress, from *Etliche underricht zu Befestigung der Stett, Schloss unnd Flecken*, 1527.

The work of Albrecht Dürer is emblematic of this transformation. He turned drawing into a scientific instrument that used numerical notation to supersede any incongruous description of reality. In order to reproduce and exploit natural forces, one needed to understand how they were composed and operated. Reality had to be sectioned and quantified into intelligible parts – its inner laws scientifically investigated – and reassembled in three dimensions according to the principles deduced. In his treatise on measure, Dürer adopted the term *diagram* (*Aufgerissen* or *Aufriss*, "what divides and makes visible," or simply "outline") to refer to the sectioning of reality through perpendicular planes and the translation of objects into series of coordinates in space. Any object of whatever complexity could be thus measured and reduced



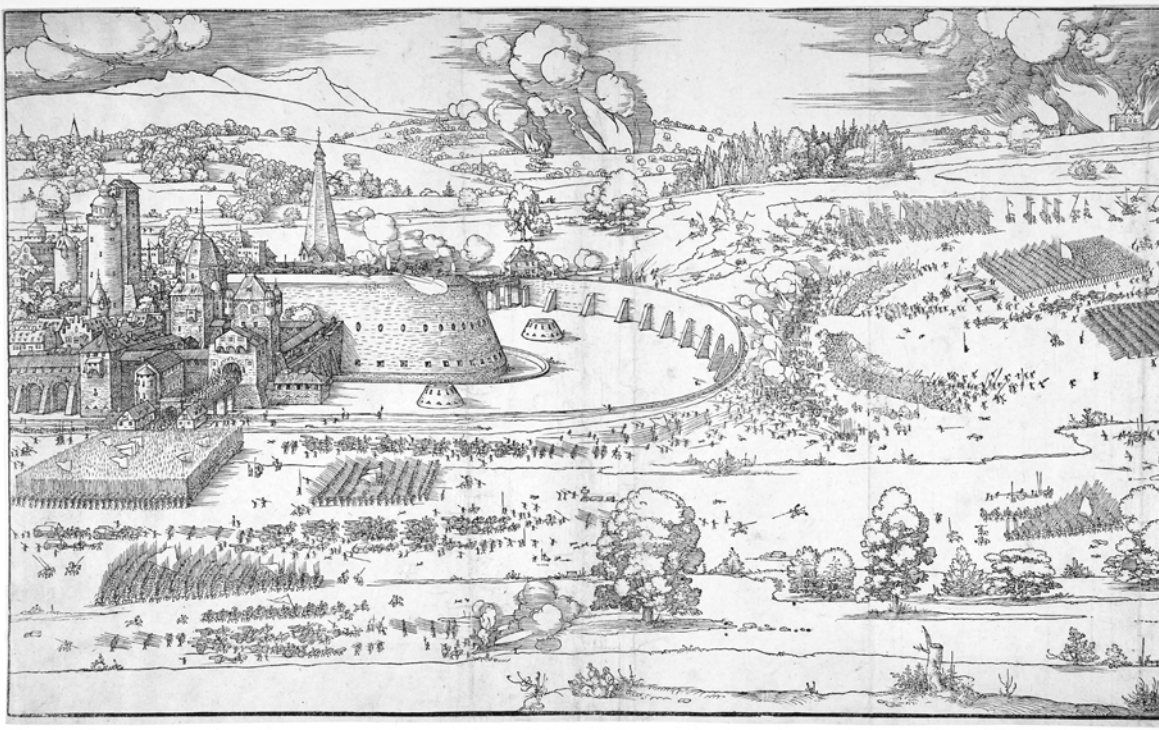
Sebastiano Serlio, folio 1v from *Ottavo libro d'architettura: Della castrametatione di Polybio*, 1551–54. Restitution of the Polybian military camp in form of a built city. General Plan. Courtesy the Bavarian State Library.

to a set of solids, planes, lines, and points. Even the human body could be anatomically dissected into separated parts, rotated and deformed by simple alterations of coordinates.[8] Orthogonal projection not only represented objects *in* space but also the space *of* objects, allowing an immediate understanding of their inner properties. By rendering objects in their measured form, orthogonal projections detached the act of vision from the singularity of the observer, transposing it to an infinite point of view. This was a radical act of estrangement for the sake of the pure rationality of the architectural drawing: the vanishing point of the *costruzione legittima* was thus replaced by the neutral objectivity of the axonometric view, recovering the loose autonomy of objects in their natural dispositio.[9]

In his treatise on military architecture, written after the Second Diet of Nuremberg against the Turkish threat, Dürer proposed a project for a city in the form of a fortress in which architecture and logistic infrastructure would coincide.[10] He imagined a concentric city based on monarchical power: a central square defined by the royal palace, the town hall, and a market, and surrounded by housing organized by trade ranks and peripheral rows of workshops. Like a machine, his city plan privileges efficiency over formal elaboration: it forgoes all decorative traits, achieving an austere functionality and an absolute precision of measurement. The different parts of the city work as organs and limbs, generating a complex assemblage of moats, earthen bulwarks, tilted ramparts, and corner bastions shaped according to ballistic calculations.[11] In the project for an angled fort there appears a twofold diagram of the city-fortress as a whole: while the external concatenation of scorched land, ditch, and circular casemate brings the topographic surroundings under the measured control of the fortress defense system, the warehouse platform provides a modular unit for planning both the inner barracks and the whole urban fabric.[12]

Dürer's treatise concludes with the famous woodcut *The Siege of a Fortress*, which prophesizes the imminent extension of the defensive urban apparatus beyond its own walls and the spread of military discipline across the whole territory. Dürer renders troops and buildings with the same regular and compact forms, their movements and compositions controlling and structuring the large plateau around the fortress. It was here on this abstract battlefield that the logistic order of war machines, which was first translated into the geometric organization of the city, found its ultimate application on

8. Albrecht Dürer, *The Painter's Manual: A Manual of Measurement of Lines, Areas, and Solids by Means of Compass and Ruler*, trans. Walter L. Strauss (New York: Abaris Books, 1977). See also Erwin Panofsky, *The Life and Art of Albrecht Dürer* (Princeton: Princeton University Press, 1955), 244–73; and Walter L. Strauss, *Complete Drawings of Albrecht Dürer*, vol. 5, *On Human Proportion* (1528; New York: Dover, 1972).
9. See Massimo Scolari "Elements for a History of Axonometry," in *Oblique Drawing: A History of Anti-perspective* (Cambridge: MIT Press, 2012), 1–23.
10. Dürer's *Etliche underricht zu Befestigung der Stett, Schloss und Flecken* [Several instructions for fortifying towns, castles and small cities], published in 1527, was the first printed work on fortifications and also the first to present a juxtaposed plan, section, and elevation for an individual project all at the same scale. See Mario Carpo, *Architecture in the Age of Printing: Orality, Writing, Typography, and Printed Images in the History of Architectural Theory* (Cambridge: MIT Press, 2001).
11. See John A. Pinto, "Origins and Development of the Ichnographic City Plan," *Journal of the Society of Architectural Historians* 35, no. 1 (March 1976): 35–50; Panofsky, *The Life and Art of Albrecht Dürer*; and William Martin Conway, *Literary Remains of Albrecht Dürer* (Cambridge: Cambridge University Press, 1889).
12. No doubt influenced by Dürer, Sebastiano Serlio proposed a hypothetical restitution of a Roman military encampment in the solid forms of a *citadella murata*, a "walled city," translating the Polybian tents, pavilions, stables, and garrisons into modern housing types and civic architecture and filling vacant lots with an amphitheater, circus, and thermal baths "for the soldiers' health and delight." Serlio even provided detailed plans for both fabric and brick versions of each building of the encampment, experimenting with various architectural solutions for different social classes. In consolidating the nomadic and sedentary forces of the battlefield into a model for the administration of the city, Dürer's and Serlio's projects each advanced the development of the Vitruvian *machinatio* into a science. For a general account of Serlio's project, see William Bell Dinsmoor, "Literary Remains of Sebastiano Serlio," *Art Bulletin* 24, no. 1 (March 1942): 55–91; and Sebastiano Serlio, *Architettura civile: Libri sesto, settimo e ottavo nei manoscritti di Monaco e Vienna*, ed. Francesco Paolo Fiore (Milan: Il Polifilo, 1994).



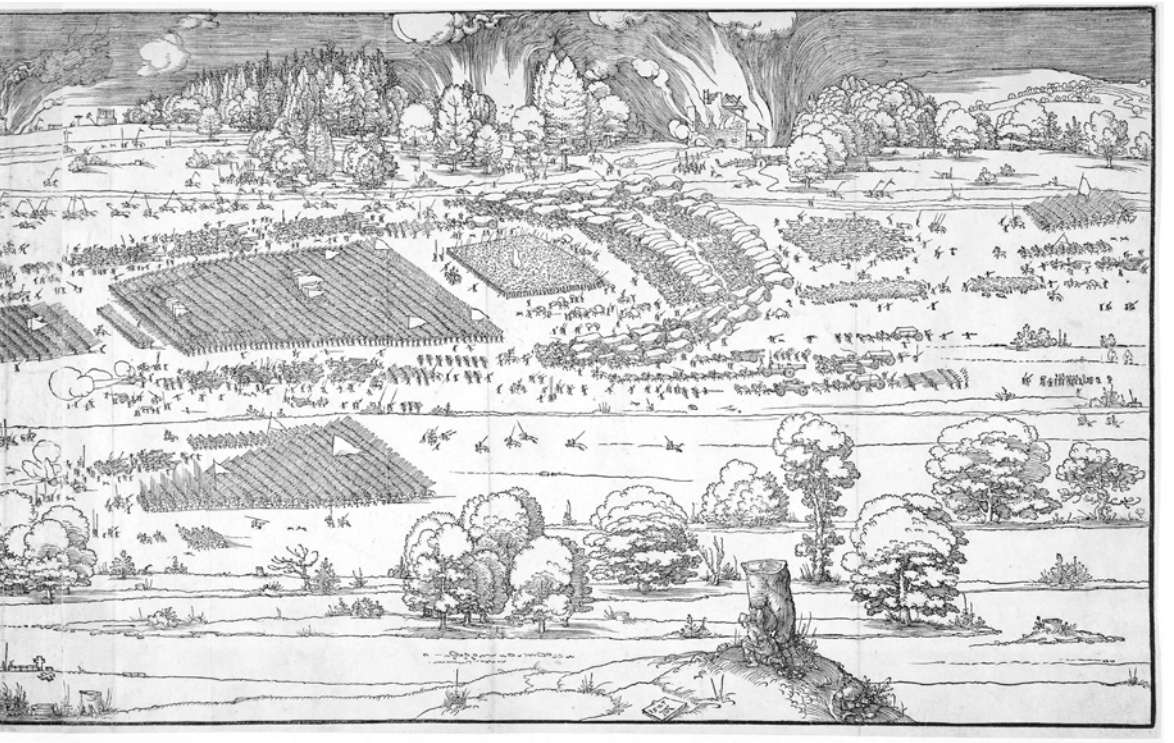
Albrecht Dürer, *The Siege of a Fortress*, from *Etliche underricht zu Befestigung der Stett, Schloss und Flecken*, 1527.

the soldier's "docile bodies," framing their movements and administering their cooperation through *ordinanze*.[13]

Soon the siege would be over, for war would extend everywhere; the isotropic condition of capitalist exchange would swallow the fortress and its ramparts, reducing the city and its architecture to what Archizoom Associati would call a "non-figurative language" and translating the *ordinanze* into a homogeneous repetition of identical columns and technical cores – a plane of total equivalence. Thus, long before the industrial revolution and the rise of mass production, the convergence of technical representation, warfare, and civic organization produced a modern formulation of logistics as a technical device for administering space and time – from single objects to the city at large, from stocking and transportation of provisions to financial investments – in a form of abstract rationality that today provides the conditions for the metropolis to subsist.

2. Exchange and Real Abstraction

The essence of modern logistics is exchange. Commodities are equivalent by virtue of their exchangeability.[14] Transaction presupposes the commensurability of the goods exchanged – that is, a system of reference to calculate the magnitude of



value, irrespective of the use value embedded in the goods, the individuality of buyer and seller, or any other external influence. When considered in terms of use value, things have intrinsic qualities and specific relations with their users. When seen in terms of exchange value, commodities are subject only to differentiations in quantity. In other words, whenever something is exchanged, it becomes implicitly quantified and stripped of all its peculiar features.

An evident example of abstraction, in this sense, is labor. When men bring the products of their labor in relation to each other, they not only equate their differences as values but also abstract the different kinds of human labor as fungible labor "without being aware of it."[15] In determining the magnitude and substance of value, labor becomes an abstract homogeneous entity – "labour sans phrase," as Marx defined it – "not this or another labour but *labour pure and simple*, abstract labour; absolutely indifferent to its particular *specificity* [*Bestimmtheit*], but capable of all specificities."[16] Labor ceases to be an expression of creativity and self-consciousness and becomes merely a person's livelihood. Losing the specificity of its purpose and the relation with its performing subjects, it is reduced to an abstract measuring principle for the value of commodities: a labor uniform in quality and

13. *Ordinanza*, or *forma*, was the particular arrangement of troops in war according to rank. In ancient war treatises, *ordinanze* are not usually described by means of figures but through a particular typographic system that associates alphabetical letters with soldiers on the battlefield. This form of abstract representation, which reduced men to letters and troops to geometric figures, was derived from the work of Aeneas Tacticus, a Greek military writer who, in the second century BCE, edited one of the first known treatises on war and military stratagems. Dürer was familiar with Nicolò Machiavelli's *L'arte della guerra* (1520), which included a compendium of Roman *ordinanze*. See Guido Beltramini, ed., *Andrea Palladio and the Architecture of Battle*, trans. David Kerr (Venice: Marsilio, 2010).

14. See Alfred Sohn-Rethel, *Intellectual and Manual Labour: A Critique of Epistemology* (London: Macmillan, 1978), 46.

15. Karl Marx, *Capital: A Critique of Political Economy*, vol. 1, trans. Ben Fowkes (London: Penguin, 1976), 166.

16. Karl Marx, *Grundrisse: Foundations of the Critique of Political Economy*, trans. Martin Nicolaus (New York: Penguin, 1993), 296. Emphasis in original.

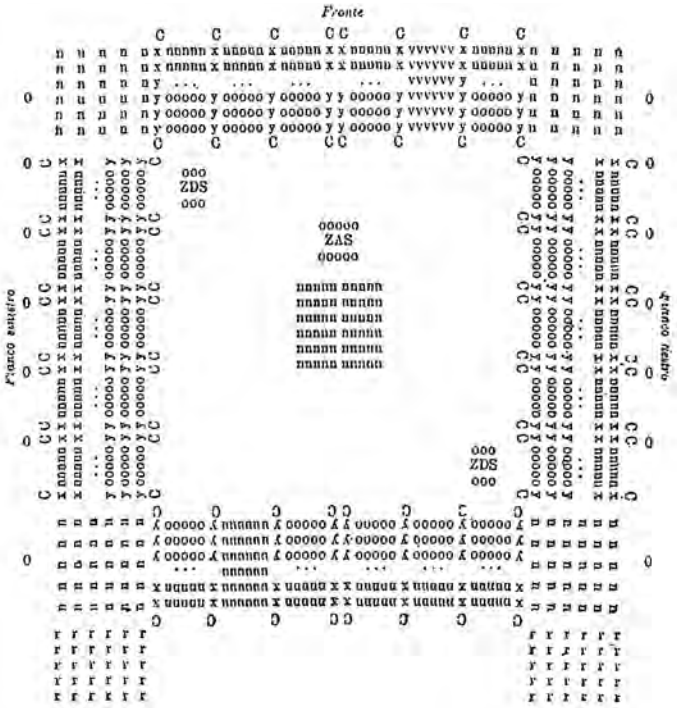
only different in quantity, a labor indifferent to the modes of expenditure and the concreteness of its use value. Yet this abstraction is not the product of the mind; it arises from pure facts, the proliferation of exchanges, the growth of population, the extension of material activities, the emergence of new needs and branches of industry, the evolution of social organizations, and the technical transformations of the environment using ever more sophisticated instruments and systems of calculation.

For Marx, abstraction was not mental but *real*: it did not have a logical genesis but rather a *historical* genesis, one consubstantial with the social evolution of capitalist production. Only in a society where labor becomes so widely articulated and diffused in variations and differences – to the point of becoming the primary means for creating social wealth – could it be generalized as labor without qualities: "As a rule," Marx states, "the most general abstractions arise only in the midst of the richest possible concrete development, where one thing appears as common to many, to all. Then it ceases to be thinkable in a particular form alone."[17]

17. Marx, "The Method of Political Economy," in *Grundrisse*, 104.
18. See Sohn-Rethel, *Intellectual and Manual Labour*, 53.

Real abstraction is not the fruit of purified logical distillations but the expression of endless concrete combinations and spatiotemporal activities carried out by autonomous individuals. The act of exchange takes time (for transportation, delivery, storage, and payment), which is emptied of its material consistency, and occurs in space (distances, harbors, oceans, and territories), which is rendered as a neutral surface. Every transaction implies the equivalence of the exchanged lots. Commodities are not to undergo physical change, and their conditions are to be kept constant. Postulating space and time as continuous and homogeneous entities, the architecture of logistics could be considered an outcome of the principle of exchange: boats, containers, warehouses, department stores, piers, train stations, and cargo terminals are means to preserve the substantial integrity of exchanged commodities and are therefore configured according to the same principles that govern the act of exchange.

Abstraction thus reveals itself as a tangible and operative process that derives from very practical concerns and generates an artificial nature: an atemporal and aspatial dimension of quantities and measurements that is nevertheless concretely embedded within the cycle of production, distribution, and consumption.[18] Hence, the architecture of logistics and the architecture of the city work according to different systems of logic. Where city and infrastructure once coincided

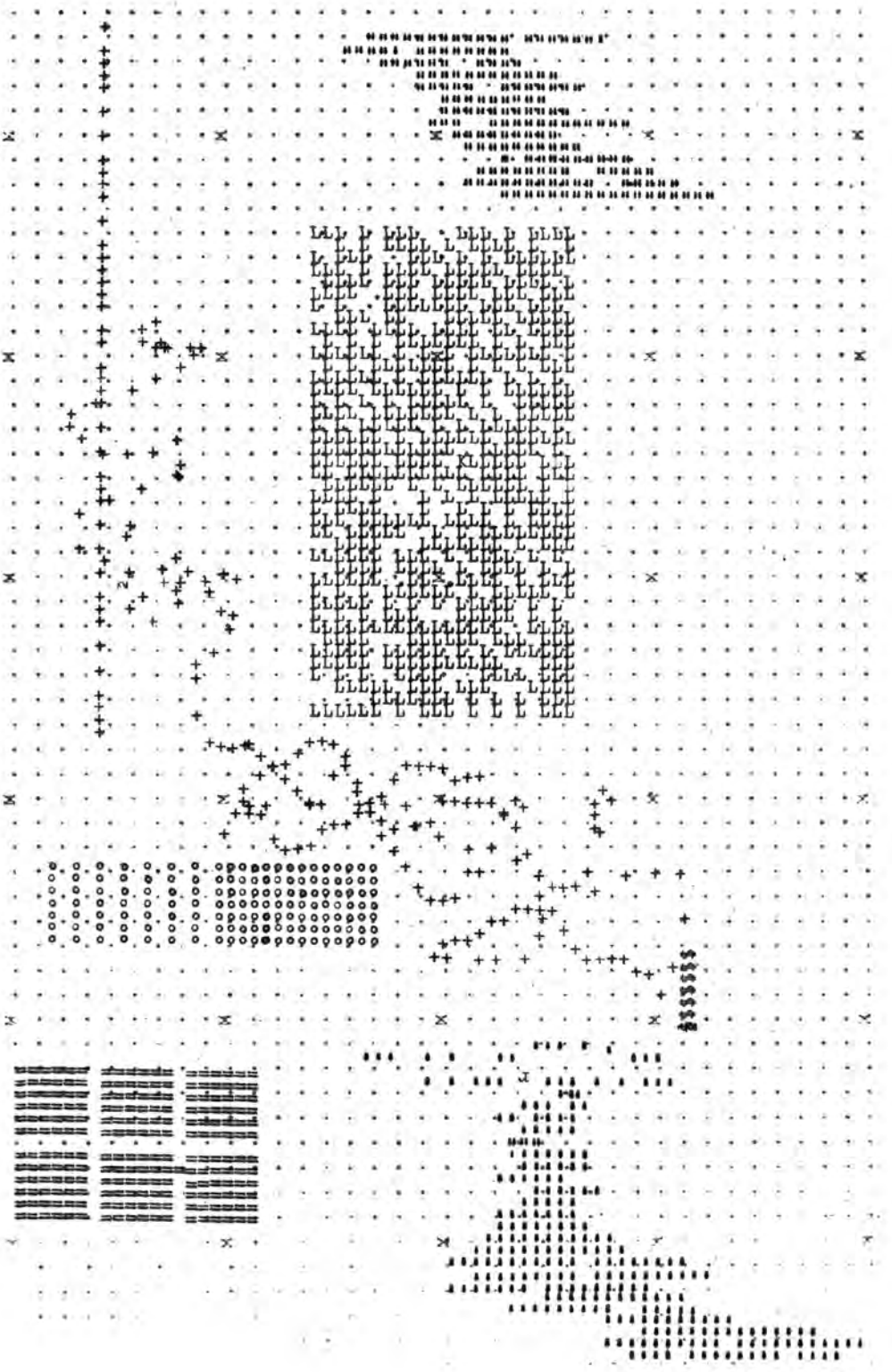


Niccolò Machiavelli, form of a squared army, from *The Art of War*, 1521.

within a unique man-made artifact, in the last century the proliferation of trade and the intensification of circulation, supply-chain management, and containerization have created networks of exchange that are able to structure the city without regard to its historical stratifications. The architecture of the city is considered as a series of layers that accumulate over time, marking the historical uniqueness of its places, whereas the architecture of logistics offers an ever-changing environment that constantly reworks its own past and predicts the future through its own ruins in a "perennial gale of creative destruction."[19] Built and demolished to sustain the validity of exchange abstraction, logistic facilities have a life span of a few decades, as they are constantly transformed according to global economic shifts, new technologies, and evolving forms of labor management.

19. Joseph A. Schumpeter, *Capitalism, Socialism, and Democracy*, 5th ed. (London: Allen and Unwin, 1976), 84.

This particular abstraction – this *real* abstraction – also gives impetus to cognitive advancement. It provides the conceptual ground for the mathematical and social sciences to erect autonomous systems of knowledge and to hypostatize notions that may eventually reverberate throughout society. As Alfred Sohn-Rethel demonstrates, the whole evolution of cognitive abstraction and human rationality is a reflection of practices of exchange: from the very first redistribution of surplus production in ancient Egypt, where the first



geometric measurement of land permitted the harvest to be divided among the peasants and the revenues to be calculated for the pharaoh; to the spread of coinage in the seventh and sixth centuries BCE, characterized by Pythagorean mathematics, Greek philosophy, and abstract Euclidian geometry; to the establishment of international banking and credit systems in the 13th century for financing the merchant explorations, which resulted in the evolution of mathematical calculus, perspectival and axonometric geometry, naval and warfare technology, medicine, and chemistry; to the 17th century, when Galileo translated the real abstraction of commodity exchange into the modern laws of physics and inertia.

In other words, the farther the requirements of exchange expanded across the planet – spreading the standardization of time, space, matter, quantity, and motion – the more they constructed a "kind of abstract framework into which all observable phenomena are bound to fit" and on which every system of production is based.[20] The Homogeneous Living Diagrams proposed by Archizoom in their manifesto "City, Assembly Life of Social Issues, Ideology and Theory of the Metropolis" was an attempt to project a sort of self-fulfilling apparatus of exchange: ***homogeneous***, because reality was universally one of production; ***living***, because when labor and life coincide the genericness of life becomes the highest source of profit; ***diagram***, because such a plan brandished both the immanent forces of class struggle and the power relations at stake.[21] No-Stop City, which followed, was essentially a logistic project that reduced the city to an endless plateau for the circulation of commodities and people – a "residential parking lot" – dismantling the traditional distinctions between centers and peripheries, the rhetoric of isolated objects and compartmentalized functions: categories that no longer applied on the new plateau of distribution and consumption. The city Archizoom proposed was based on a very simple structural scheme, its plan not so different from those typical of factories, supermarkets, and dwelling units: a "bi-dimensional grid where all the components mutually balance themselves with equal levels of freedom and facilities" distributed homogeneously as if air conditioning or electric lighting.[22]

It was no coincidence that, a few years before, in 1966, the first Sea-Land shipping containers arrived in Europe.[23] Around the same time, Cedric Price had been attempting to link logistics with the architecture of education. His Potteries Thinkbelt, an attack on secluded upper-class education and England's redbrick universities, envisioned a linear system

20. Sohn-Rethel, *Intellectual and Manual Labour*, 73.
21. This manifesto provided the basis for the proposal for Florence University, which was conceived as an endless territorial machine for the supply-chain distribution of commodified education, as well as the famous No-Stop City. Archizoom Associates, "Città, catena di montaggio del sociale: Ideologia e teoria della metropoli," *Casabella* 350–51 (July–August 1970); reprinted in Andrea Branzi, *No-Stop City* (Orléans: HYX, 2006), 162. See also Archizoom Associati "No-Stop City: Residential Parkings, Climatic Universal System," *Domus* 496 (March 1971): 49–55; and Archizoom Associati, "Progetto di concorso per l'università di Firenze," *Domus* 509 (April 1972).
22. Archizoom Associati, "Città Catena di Montaggio del Sociale," *Casabella* (July–August 1970): 48.
23. Among the vast literature on logistics and architecture, see Marc Levinson, *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger* (Princeton: Princeton University Press, 2006); Alberto Toscano, "Logistics and Opposition," *Mute*, August 9, 2011, http://www.metamute.org/editorial/articles/logistics-and-opposition; Alberto Toscano, "Lineaments of the Logistical State," *Viewpoint Magazine*, September 28, 2014, https://viewpointmag.com/2014/09/28/lineaments-of-the-logistical-state; Sergio Bologna, *Le multinazionali del mare: Letture sul sistema marittimo-portuale* (Milan: EGEA Editore, 2010); and Franco Bortolini, "Storia del container," *Primo Maggio* (Fall 1978–79): 7–15.

Archizoom Associati, Hypothesis for a Non-Figurative Architectural Language, 1970. Courtesy the architect.

of learning facilities on the industrial ruins of an abandoned pottery and its infrastructure in the English Midlands. Price conceived education as a collective service to be efficiently distributed like "the supply of drinking water" and thus organized as territorial infrastructure. If in the past military defense, natural resources, and trade generated cities, "this project assumes that education and the need to exchange information may have a similar generative force: cities can be made by learning."[24] Price's drawings reduce life and learning to pure logistic operations: "transfer areas" and "assembly zones" accommodate teaching and information exchange; laboratories are placed along rail-road connections and aerial transporters, packed in "short-term portable enclosures," and equipped with facilities for handling and distributing the masses of students and employees; "parking" is not just an annexed function but a way to arrange programs; working areas and housing are arranged in "crate" or "battery" systems of standardized volumes, container terminals adjustable by means of gantry cranes.[25]

Containerization revolutionized the architecture of logistics and physically reconfigured wharves, stations, boats, trucks, trains, and warehouses around a new volumetric standard (the 20-foot equivalent unit, or TEU). Cargo was no longer processed directly from vessels to barges but stored in standard boxes, minimizing downloading times while accelerating stevedoring processes. Goods once stocked in pieces, barrels, and boxes were packed and individually coded inside containers devoid of smell, disorder, accident, and physical strain. Loading and unloading operations were gradually mechanized and computerized to ensure overall control over the movements of any single object. Transfer points were connected along the major routes of distribution, and containers identified using information and communications technology: what in the factory occurred along the assembly line was extended as territorial infrastructure.

3. Fulfillment

After Malcom McLean introduced container shipping in 1956, logistics drastically changed the rules of production: the more the sea of material exchanges extended across lands of consumption, the more supply-chain management became an unavoidable sector of the neoliberal economy. Where Fordism imposed standardized objects on masses of consumers through assembly lines and hierarchies of subcontractors, today's neoliberal economy reverses the procedure. Contemporary lean

24. Cedric Price, "Life Conditioning," *Architectural Design* 36 (October 1966): 484.
25. On Potteries Thinkbelt, see Cedric Price, "Life Conditioning," *Architectural Design* 36 (October 1966): 483–97; and Pier Vittorio Aureli, "Labor and Architecture: Revisiting Cedric Price's Potteries Thinkbelt," *Log* 23 (Fall 2011): 97–118.

Amazon fulfillment center, Rugeley, United Kingdom. Photo: Ben Roberts.

production – from its early development at Toyota to recent applications at Walmart and Amazon – determines the volume of goods to be produced, as well as the manufacturing process and mode of distribution directly based on consumer demand. Moving backward, from end-user requests to customized objects, lean production processes materials in different places and at different times via an extended network of autonomous suppliers and assembly operators. If the modern factory increased the pace of production by improving the internal circulation of raw materials and components within a confined manufacturing process, neoliberal production aims to intensify the external circulation of commodities, reducing distribution time and thereby cutting the turnover gap between production and consumption.

As Marx claimed, the evolution of capitalism depends on the rapidity of its cyclical turnover – production, distribution, and consumption – which drastically accelerates the ordering of the city through transportation and communication networks.[26] Economies of scale have been replaced by economies of scope: the more effectively information can be analyzed and

26. Karl Marx, "The Turnover of Capital," part 2, *Capital: A Critique of Political Economy*, vol. 2, trans. David Fernbach (London: Penguin, 1992), 231–424.

processed, the faster materials and goods can be dispatched along chains of distribution – and the higher the final profits. Warehousing facilities are equipped with just-in-time technologies and flexible storage systems to eliminate waste and quickly allocate, catalogue, and process commodities according to the unpredictable oscillations of demand and supply. Not unlike modern daylight factories, warehouses evolved from 19th-century multistory buildings where bulk cargo and commodities were processed in units into large single-story sheds with electrified rails, forklifts, and racks and moved in pallets or standardized volumes. Over time the use of containers exponentially increased the number of surfaces available for loading, unloading, storage, and transfer, reducing the need for buildings and transforming logistic epicenters into what Reyner Banham called "flatscapes with containers."[27]

On the other hand, with the evolution of communication systems and the diffusion of e-commerce, *fulfillment* – that is, the service of storing, receiving, packaging, and shipping items to end consumers – has become one of the dominant pursuits of logistics. In general terms, fulfillment is about satisfying demand: the wealth of nations flows across a global network of distribution and is coded and measured to be redistributed via inland harbors and container terminals. The fulfillment center might thus be considered the litmus paper of the present neoliberal economy: a real-time cross section of objectified desires, interests, perversions, and needs.[28] Conceived as a temporary shelter for commodities, the fulfillment center – whose only determinant features are its volume of storable merchandise and its number of covered square meters – appears in plan as a horizontal floor of information where only the most requested items lie in sectors recognizable as such while other items move constantly, transferred and sequenced according to space availability and time slots.

Indeed, the plan of the fulfillment center is based on calculated disorder. Its architecture is generic, ruled only by a standardized set of dimensional protocols that generate a space defined by the virtually unlimited repetition of a limited set of forms. Yet a fulfillment center is always site specific, determined by particular trends in consumer desires, market demands, local productive networks, and working relations. Goods are neither grouped in fixed sectors nor according to specific type, as in supermarkets or in traditional warehouses. Instead, they are simply arranged on shelves or racks according to size and trend in consumption, following abstract algorithms and complex rates of input/output. Commodities are

27. Reyner Banham, "Flatscape with Containers," *Architectural Design* 38, no. 11 (November 1968): 510–11.
28. See Behemoth (Amir Djalali, Hamed Khosravi, and Francesco Marullo), "The Architecture of Fulfilment: A Night with a Logistic Worker," presented at the 14th International Architecture Exhibition at the 2014 Venice Biennale.

indexed in data banks, measured and recorded in barcodes that allow real-time tracking of their location, weight, dimensions, and place and anticipated date of delivery. Workers' movements are not based on repetition and simplified gestures, as on the Fordist assembly line, but vary according to the vicissitudes of production needs. This flux is channeled through information systems that direct workers through barcode readers while at the same time recording their performance and speed.

But the fulfillment sector does not only generate particular architectural configurations. It also offers very specific forms of employment: from truck drivers to IT technicians, from security operators to cleaners, from finance analysts to stevedores to local and migrant workers with precarious seasonal contracts. Although often condemned as "architectures without humans" for their high level of technical automation, fulfillment centers constitute a breeding ground for workers' opposition and organization, as witnessed by the recent demonstrations in San Francisco and Rotterdam, or the 2014 strikes staged at Amazon, TNT, and DHL fulfillment centers in Germany, France, and Italy. These events – in addition to calling attention to low wages, long hours, health and safety code violations, and the moral and physical browbeating to which porters and pickers are often subjected in automated warehouses – have produced new opportunities for collective bargaining and demonstrated innovative forms of unionization and protest.[29]

These forms of opposition unveil how neoliberalism works, as well as the techniques of exploitation, spaces of production, and managerial instruments deployed by logistics along harbors, at interports, and across the whole of society. Today, the logistic order affects every field of production and every form of employment. Logistics is the apparatus that makes cooperation possible while at the same time orchestrating a multiplicity of activities and modulating independent variables. A strategy of subversion that could eventually reverse its negative effects and take control of its instruments can only rise from a deep understanding of its logic and juridical principles. In this sense, the struggles of truck drivers, porters, pickers, and stevedores should be recognized as a paradigm for labor organizing, especially within "cognitive" production and the precarization of the labor market. The proliferating forms of on-call jobs, project-based work and zero-hour contracts – which have gradually eroded the traditional patterns of salaried employment spreading from

29. Several rank-and-file unions in Italy such as SI COBAS and ADL COBAS have managed in recent years to coalesce and organize the grievances of migrant workers in the warehouse sectors beyond the restrictions of national collective contracts and confederate unions, and in opposition to aggressive pressure from national immigration legislation. See Anna Curcio and Gigi Roggero, "The Revolution in Logistics," *UniNomade*, December 11, 2012, http://www.uninomade.org/the-revolution-in-logistics; Carlo Pallavicini, "Piazza Tahrir nella valle del Po – Le lotte nel polo logistico di Piacenza," *UniNomade*, November 12, 2012, http://www.uninomade.org/piazza-tahrir-nella-valle-del-po; and Niccolò Cuppini, Mattia Frapporti, Floriano Milesi, Luca Padova, and Maurilio Pirone, "Logistics and Crisis: The Supply Chain System in the Po Valley Region," Teaching the Crisis, 2013, http://teachingthecrisis.net/wp-content/uploads/2014/03/Italy_Logistics_and_Crisis.pdf.

delivery-truck drivers to film-industry workers, from janitors and caregivers to university researchers – is literally a just-in-time system of employment: a perfectly modulated logistical landscape that calibrates distribution of the labor force according to production requirements, information exchange, value rates, and financial fluctuations.

At the same time, if logistics accelerates the growth of production through the heavy materiality of its abstract procedures, it also fosters entropy of the capitalist apparatus and possibilities for subversion. Seen from this twofold perspective, logistics reduces architecture to either an episodic manifestation or an impotent background, irreducible to any traditional definition of "place" and beyond the easy ideology of "publicness." Thus, besides offering a privileged instrument to understand the tendencies and forces at work within contemporary production, the architecture of logistics compels us to update the categories through which we read politics and the city, the role of the architect, and the discipline of architecture.

Within the automatized landscape of harbors, warehouses, and fulfillment centers, logistics today remains an art of war. But whereas in the past it dealt with external enemies, today its battlefields have been internalized; the borders that for Schmitt distinguished friends from enemies have been introjected within the extended competitive space of the metropolis. They have become thresholds of intensities, modulators of value, and limits of the measurement and control of labor. The deployment of troops has been replaced by the transnational migration of the labor force, the microdisciplinary techniques of control, and the management of information. Military camps have been transformed into dormitories, free-trade zones, and centers for detaining, expelling, and redistributing migrants. Logistics today is the art of class war.

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