THE BIRTH OF THE BOX:

ON THE ORIGINS OF THE DOMINANT ARCHITECTURAL FORM

By

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Abstract

This thesis tries to answer two questions. One: why is it that in the last seventy years so many buildings around the world look the same? Two: why is it that this similarity takes the form of a glass and concrete box? To answer these questions, the thesis makes three arguments. First, that the technologies and organizations which gave birth to the box partly emerged in the 19th century as a result of developments in industry and commercial real estate in the UK and in the US—the need for large fireproof buildings in industry and the need for tall office buildings in commercial real estate, respectively. As part of these processes, the proto-box also appeared in second-tier industrial buildings, but did not yet gain prestige. Second, that the pure box both got built on a massive scale and got prestige in Germany in the 1920s as a consequence of post-WWI need for housing, the availability of large-scale government housing funding, and the presence in Germany of a sizable number of artists and architects who thought that the answer to the country's housing problem was the box—even if the box, at the time, may not have been clearly better (that is, cheaper and faster to build) than its less boxy alternatives. And third, the thesis argues that the box achieved its present-day dominance in the 1950s and the 1960s in New York City, when it became the default way of building for large office developers: first the development of fluorescent lighting and air-conditioning removed the technological constraints that had made it expensive to build pure boxes bigger than a certain size; then several prestige buildings were built for non-economic reasons in the form of a pure box; and finally local laws, which had limited the building of pure boxes, were changed to actively encourage such forms. The thesis concludes by examining the hero-focused narratives that dominate the explanations of the rise of the box in both popular and academic accounts.

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Limitations

This work has many limitations, of which three are the most important. First, it is based mostly on secondary materials: although I consulted several primary sources that were available online, the argument does not rest on them—and they were, at any rate, mostly suggested by the secondary sources with which I worked. I did try to be broad in choosing the secondary sources that I relied on, but the limitation is there: more than is usual for a work of history, my view of history is a product of the views of other historians. Second, what sources I relied on were limited to languages that I can read—a constraint for any scholar, but a particularly important one in my case because the quarter of the thesis that has to do with what was happening in Germany in the 1920s is based on English-language sources. I do not read German well enough to have consulted German works, and in any event, far less is available online in the German language than in English. Which brings me to the third limitation: because I wrote most of the thesis in early 2020 in a village in Georgia (the Republic of), the works that I used were either those that I already owned or those that I could find on the Internet. One can, these days, find a surprising amount of material online, but nonetheless, there were works that I wish I could have consulted and could not (some of them are mentioned in a separate part of the bibliography). All things considered, if this work has any value at all, it is mainly in that it offers a different way of thinking about an old issue—one that I could not find, in one piece, in any of the works that I have read. If, in the unfolding of time, it would make it easier for myself and for others to ask of primary sources the sorts of questions that not enough people appear to have asked of them before, I would only be too happy.

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Introduction

Why do so many buildings built in the last seventy years look so similar all around the world and why does that similarity take the form of a glass and concrete box? With all that technology can do, why is it that more buildings do not look like different from each other? After all, right until sometime in the 19th or early 20th century there used to be a lot of diversity about how people built, and now there is not. What gives?

Perhaps the reason most buildings are so similar is that they are built for similar reasons by similar types of entities (mostly for-profit developers; sometimes governments)—and the box is the form that most suits those entities considering what is important to them (which is thinking of buildings as square meters in relation to money). The technology of the box—both how one makes it and how one controls what happens inside it—is, moreover, sophisticated enough that it can overcome the constraints of climate and materials that in the past would have prevented it from spreading across very different areas of the world. This, at any rate, is what this thesis argues.

The argument has four parts.

One: In the nineteenth century, profit-maximizing companies developed some of the box's underlying technologies, including reinforced concrete and the steel frame. These came out of these companies' needs: the need to build wide and fireproof in industry and the need, in at least a couple of American cities, to build tall in offices. This mainly happened in England and in the US, though to some extent also in France and produced early prototypes of the box—partly in offices, but especially in second-tier industrial buildings (office buildings could not be pure boxes yet because of limitations of lighting technology and the particular constraints of the laws of cities in which they stood).

Two: In the 1920s in Germany, some municipal governments that were working on solving the country's housing problem took the very substantial funding that the national government gave them after 1924 and gave it to people who thought that the box—derived in a loose way from what was happening in industry—would provide the answer to that problem by making it possible to build housing quickly and cheaply. They did not quite get that answer—it is not clear that the box was quicker or cheaper than the more traditional shapes of building (England, for example, built "boxes with lids")—but they did build a decent amount of pure boxes, especially in Frankfurt and Berlin. More importantly than just building, the architects of the box did enough cultural work (books, articles, exhibitions) for the box to get cultural prestige so it became possible to build the box not just in second-tier industrial buildings but in buildings in city centers. Box-building in Germany mostly stopped with, first, the Great Depression and, second, the Nazis (some of whom disliked boxes and the people who built them enough to make life difficult for at least the first tier of those people), but the example was set.

Three: After WWII, the box achieved final victory in office building in New York—and then elsewhere. Technology—fluorescent lights and air conditioning—made it possible to build the pure box, which was the form that made developers the most money. The laws though only made it possible to build the pure box if one did not care about maximizing profit, which meant that most people still built non-boxes—but there were several examples of the pure box being built in the 1950s for prestige reasons, and once the law was changed to make it possible to build the pure box if one was after the greatest profits as well, most other office buildings became pure boxes. From then on, most architect-designed buildings in the world became boxes of varying degrees of purity.

Four: The amount of boxes that was being built created a hegemony in a real sense: one in which it is difficult to build a non-box even if one wants to because the box is what

everyone expects and knows how to build. It created a hegemony in a mental sense as well: one in which one may not even want to build a non-box in the first place because the sorts of stories that one hears about why the box is the dominant way of building—focused on the individual architects who first proposed it—make it difficult to understand how it comes about and how something else might come about instead. Societies, therefore, are stuck with boxes for the foreseeable future.[1]

One may argue about whether or not a future of more boxes is desirable. But regardless of what one thinks, one may at least want to know how that future came to be one towards which we are headed—and how we got the past that we already have. That is the purpose that this thesis tries to serve.

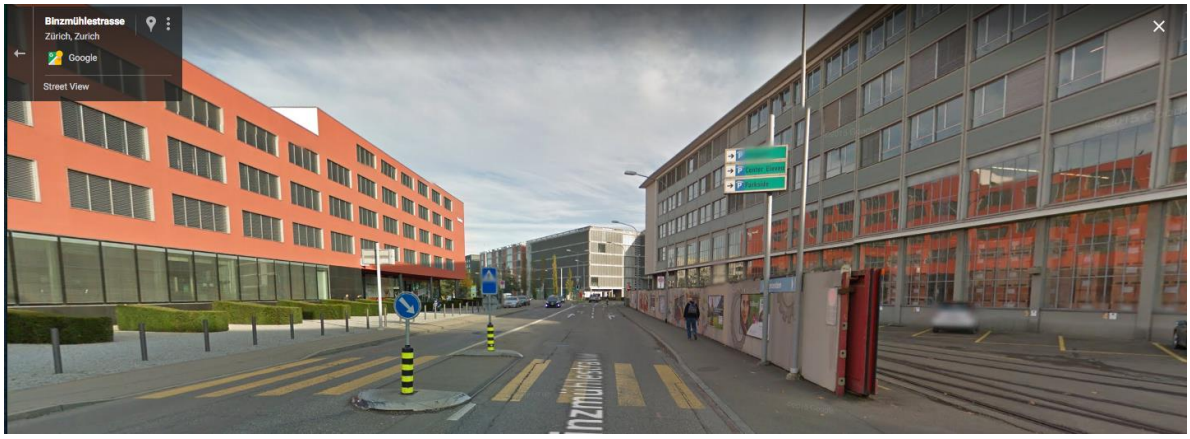

Figure 1 Boxes in an urban landscape, Zurich Oerlikon, 2014 (Google Street View)

[1] If at this point one wants a more precise definition of the box, let Alfred H. Barr Jr.'s words in the introduction to Hitchcock and Johnson's *International Style* do that: "The distinguishing aesthetic principles of the International Style as laid down by the authors are three: emphasis upon volume—space enclosed by thin planes or surfaces as opposed to the suggestion of mass and solidity; regularity as opposed to symmetry or other kinds of obvious balance; and, lastly, dependence upon the intrinsic elegance of materials, technical perfection, and fine proportions, as opposed to applied ornament." Henry Russell Hitchcock and Philip Johnson, *The International Style* (New York, Norton, 1966), 13, http://archive.org/details/internationalsty00hitc.

The early years: The appearance of proto-boxes in industry and offices in the UK and the US before the early 20th century

Building started with difference: different people, different ways, and different reasons to build in different places around the world. But from the 18th century on, a move begins towards a kind of sameness. And that is because there is a new agent that does what all agents do: build in its own specific way. And what this agent does spreads—for the first time in history—all over the world, and so do the agent's buildings. The agent is the profit-maximizing firm, and what it builds is the proto-box: a proto-box factory or a proto-box office because that is what makes the most sense for its profit-maximizing purposes. The firm (and the system of government on which it depends) spreads because it gives power (and money) to the people who set it up (and because it gives some people some of what they want—and forces it upon others). And its buildings can be repeated all over because it uses technology to overcome the constraints that in the past created difference: the constraints of materials and of climate (and of physics, too, though those are universal). Let's look at how this happened: at how the agent evolved and how the buildings evolved together with the agent, in four stages.

Stage 1: Growing big: The first factories

This stage starts sometime in the early 18th century. Before this stage, there are of course firms that try to maximize their profits—but they do it through selling things that other people made (usually somewhere far away) and not through making things themselves. This changes. British firms take imported cotton—first from the Caribbean and then from the Southern US—and make that cotton into shirts. They use simple machines, water power, and a lot of cheap labor (mainly of women and of children). They sell these shirts all over

the world—which is easy, first, because Britain has a large empire and, second, because it uses its navy to force countries that are not part of the empire to let these firms sell—and make *a lot* of money; perhaps ten times what they put into it. And that is because people will pay much more for these shirts than it costs to make them, which is because those shirts are either better than what people were using before (which is wool or hemp or flax or—if they were rich—silk) or—more importantly—much cheaper. For some time—throughout most of the 18th century—the world will buy as many of those shirts as British firms will make, and the British do, in fact, make a lot.[2]

What does it mean for buildings? Well, when British firms first start making cotton shirts they mostly do that in regular buildings.[3] Actually they often use the buildings in which people live: it is the so-called putting out system. In that system, whoever owns a firm that sells shirts finds some people who want to make them, gives them cotton, and pays them for each shirt they make. Those people have simple machines in their homes on which they make those shirts—and that's the whole system. Now, that lasts for some time, but eventually you begin to get machines that are big enough and expensive enough that a single worker family cannot make them or buy them. But you do want those machines as a firm because they can make things faster and cheaper than the smaller machines: so you start buying those bigger machines and putting them into buildings that are only for that—the first factories. You could use buildings that already exist or—if you begin to get big enough or if you want to use water power as opposed to human or animal power—you could build something new.

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[2] See E. J. Hobsbawm, *The Age of Revolution 1789-1848*, 1st Vintage Books ed (New York: Vintage Books, 1996); E. J. Hobsbawm and Chris Wrigley, *Industry and Empire: From 1750 to the Present Day* (New York: New Press ; Distributed by W.W. Norton, 1999); and the earlier classic Paul Mantoux, *The Industrial Revolution In The Eighteenth Century* (London: Jonathan Cape, 1928), http://archive.org/details/in.ernet.dli.2015.17004.

[3] William Harvey Pierson, "Notes on Early Industrial Architecture in England," *Journal of the Society of Architectural Historians* 8, no. 1/2 (January 1949): 4–5, https://doi.org/10.2307/987479.

The first example of something new—and it's rare that there is such a clear *first* example—is the Derby Silk Mill, from around 1720. It stood on the River Derwent and used its water

Figure 2 Thomas Lombe's silk mill at Derby, engraver J. Walker & J. Storer after J. Nixon, 1794

to power its machines; it had maybe 300 people working inside. Silk never became important for British industry because getting the raw materials was too difficult—but the building made so much sense for what it had to do that it became the example that others followed for the next two centuries, whatever they were making. And it is also the example that shows very nicely why the building was the way it was: a cube five stories tall, 110 feet long, and 39 feet wide.[4] The length and the height had to do with power: the power from the waterwheel had to get to the machines and the way in which it happened was that there was a long horizontal shaft on the ground floor and from that shaft, four shafts going up to the

[4] Thomas A. Markus, *Buildings & Power: Freedom and Control in the Origin of Modern Building Types* (London ; New York: Routledge, 1993), 263.

machines on the floors above (the machines for making silk were the kind that needed to rotate vertically). The shafts were wooden and could only be so long before they were going to break—and there was only so much power that the waterwheel could give, too. Hence the length and the height: 100 feet, five stories. And the width had to do with light: artificial light in the 18th century was weak, so you needed as much daylight as you could get. But because the building's walls had to bear the weight of the building and everything that was inside, the windows could only be so large—perhaps 15 percent of the wall surface, which only let so much light in. Hence the width: 30-40 feet.

Now, there is pressure for these sorts of buildings to grow bigger. Not universally, to be sure: a lot of factories in the 18th century still have only a few hundred people working in them.[5] But some, by the century's end, have maybe 2,000. Why so big? There are several reasons. Some are obvious: for example, if you become bigger, as a firm (and some firms do become quite big), you may want a bigger building both because you have more business to do and because a bigger building (as opposed to several smaller ones) shows others just how big you are. Or: it is easier in a big building to control your workers (whom you are beginning to pay by day instead of by piece because these workers now make only a part of a piece instead of a whole piece from start to finish, and so at least some workers have a reason to try and work less for the same money). Or: there is not so much water power around and it is hard to get it to work for you, so once you build all the dams and channels and tunnels that you need you want to use all the power you can get (though that reason

[5] And there was debate about how big was too big, so the economic theorist Alfred Marshall wrote at the end of the 19th century: "There are . . . some trades in which the advantages which a large factory derives from the economy of machinery almost vanish as soon as a moderate size has been reached. . . . In cotton spinning, and calico weaving, a comparatively small factory will hold its own and give constant employment to the best known machines for every process: so that a large factory is only several parallel smaller factories under one roof." Alfred Marshall, Principles of Economics (1890; London: Macmillan and Co., Ltd., 1920), 8th ed., IV.XI, https://www.econlib.org/library/Marshall/marP.html?chapter_num=26. Quoted in Joshua Benjamin Freeman, *Behemoth: A History of the Factory and the Making of the Modern World*, First Edition (New York: W. W. Norton & Company, 2018), ch. 1.

would become less important in the late 18th century once factories started to use coal-powered steam engines). And some reasons are less obvious: like the fact that Richard Arkwright, one of the two men behind Britain's early cotton industry (the other one being Jedidiah Strutt) and the man, too, who owned several patents for cotton-making machines did not, sometime in the 1770s, want to let small factories use those machines because he thought (and rightly) that those factories were much less likely to pay him for his machines than the big ones were.[6]

At any rate, there are reasons to grow big, at least for some. It takes changes to how you deal with power and light constraints to make that possible (and until it's possible you will build several buildings instead of one bigger one, as Arkwright did at his mill complex in New Lanark). With power, you first get bigger waterwheels so there is more power to distribute (so Arkwright's first mill is five stories tall, like Derby, but the second one, from 1775-76, has a bigger waterwheel and is already seven stories).[7] You also get changes to the shafts: at Albion Mill in London in the late 1780s they make them and the gears out of cast iron (with only a little wood to absorb some vibration), which means you can go to 300 feet in length.[8] For light, you strengthen walls enough that your windows can take up 30 percent of their area—and then you go even beyond what that allows you to do (whatever that is) because you have new, wider machines (the so-called automatic mules) that work much faster than the machines before so you use them and deal with the darkness inside by burning oil and gas.

This is now the early 19th century. In a hundred years, the buildings grew bigger—but not much changed about *how* they were built. All these changes, all this fighting the constraints

[6] Freeman, ch.1.
[7] Markus, *Buildings & Power*, 266.
[8] Markus, 267.

of power and light are just stretching the same shape built with the same technology: timber and brick. Why so little change in buildings when there are so many changes in machines? Probably because, for the profit-maximizing firm, the machines are where the money is. There is money in buildings, too, but a lot less: and that is because in the 18th century there is *so much* money in the machines that you, as a firm owner, only think of that. There is a large world market, and that market will take all that you give it. Which means that a firm's innovation goes into how it makes what it makes, not so much into *where* it makes it. And there wasn't someone on the outside either who could force it to think in a different way: governments did not yet care much, and banks and shareholders did not yet own enough of these firms that they could make them change what they did.[9] Firms built in ways that were available.

Stage 2: Growing strong: Industry and the iron elements

This relative freedom from having to think much about buildings begins to change by the late 18th and early 19th century, and the main reason for that is fire. Cotton burns easily, and when it burns, the factory (and much else besides) can burn with it. Arkwright's buildings, for example, were timber post and beam; the roofs were timber as well. A building like that can go down fast, in perhaps half an hour or so. In 1791 a big fire destroys a brand new mill—the same Albion Mill that used cast iron shafts for the first time. The building is one of the most advanced mechanically in its age, but structurally it's the same

[9] Charles Kindleberger writes of the situation in the 18th century: "Capital to start most enterprises came from an individual, his family, friends, neighbors, in very informal ways. For ships, the funds were initially amassed in a given port where the shipowner lived until the middle of the nineteenth century when the increasing size of ships went beyond the capacity of local markets. Fixed capital in mills was small. Buildings were often rented and frequently converted from other uses, such as abbeys or convents. The big need was for working capital; this was often scrounged by buying on credit and selling for cash. Growth came usually from retained profits." Charles Poor Kindleberger, *A Financial History of Western Europe*, 2. impr (London: Allen & Unwin, 1987), 192.

old thing: wooden posts and columns.[10] It was insured—causing one of the biggest payouts to date[11]—but not everyone had insurance and anyway what good is insurance when you lose your place in the market to those who compete with you? As an owner, you start thinking of how to make your buildings more fireproof. You also want to be doing it because the industry is growing up: you cannot any more put a few thousand pounds of capital up and start making profits. There are lots of people who are doing the same thing, both in Britain and outside, and those people are beginning to produce so much that prices begin to fall. People only need so many shirts. You, as the owner, also *need* to be doing it because now you finally have someone who is going to make you do it: you have the government. It is not just cotton that burns, and not just the factories: people burn, too. And those to whom you as a government are at least in theory responsible are beginning to find it a problem; a kind of an embarrassment. Now, maybe those people would not care so much for the kinds of people who work in those factories, but the fires do not just kill them: they can kill those who live nearby, and that includes those to whom the governments listen, which is to say, the rich. And then, of course, you have the insurance industry, for whom the reason is simple: they want to lower their risk because if they do it they can sell insurance more cheaply, which means they can sell more of it, which means they can make more money.

So between the interests of (at least some) firm owners and governments and insurers (and also bankers and investors who now finance more activity than before and who are going to make firm owners listen if they aren't already listening) you begin to get an interest in making factories burn less easily. There are different options for that: for example in America, where they have the same problem, they start to use really heavy timbers which do

[10] Markus, *Buildings & Power*, 270.
[11] Harold E Raynes, *A History Of British Insurance* (London: Sir Isaac Pitman and Sons, Ltd., 1948), 215–16, http://archive.org/details/in.ernet.dli.2015.224258.

not burn but rather char, and slowly (and as they char, they can still carry load). It is the so-called slow-burn mill construction, which the Americans use throughout the 19th century and even in the beginning of the 20th.[12] But it is fine for the Americans to use timber: they have a lot of it. There is not much timber left in Britain, so British firms turn to something else: iron. Now, using iron in buildings is not completely new: people have used iron elements in buildings and structures for centuries (in China, there were cast iron bridges in the Middle Ages and even a small pagoda; in Europe, there were wrought iron elements in, for example, the domes of the really big churches like the Duomo or St. Paul's cathedral; lintels for some of Louvre's very large windows were made of iron, too, in the 1670s). But nobody built whole buildings of iron: there was no need (and iron was expensive, too, which of course has to do at least partly with there being no great need for it). Now there is a need, and change is fast. In the 1790s you first replace timber columns with cast iron, use brick arches for the floor, and cover timber beams with plaster (which is, for example, what Strutt did in 1792-3 for his six-story mill in Derby)[13] and then, quickly, switch from timber beams to cast iron (1796-7, Shrewsbury flax mill by the Benyon, Bage, and Marshall partnership). In the early 1800s, you are getting buildings that are, for structural purposes, entirely of iron (though the walls still carry load). That, incidentally, also helps in making them wider for those new mules we talked about earlier.[14]

So all in all by the 1810s, thanks to the need to fight fires, you get transformations not just in shape but in structure. And then you get not just changes in structure but whole new

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[12] See Freeman, *Behemoth*; Lindy Biggs, *The Rational Factory : Architecture, Technology, and Work in America's Age of Mass Production* (Baltimore : Johns Hopkins University Press, 1996), http://archive.org/details/rationalfactorya0000bigg; Amy E. Slaton, *Reinforced Concrete and the Modernization of American Building, 1900-1930*, Johns Hopkins Studies in the History of Technology (Baltimore: Johns Hopkins University Press, 2001).

[13] Markus, *Buildings & Power*, 271.

[14] There were non-fire reasons for iron framing, too. For example, London's Hungerford Fish Market was built in 1836 with iron framing because of the sanitary requirements of the City of London, not because of fire safety. But of all the reasons to use iron, fire safety was by far the most important.

structures altogether: you begin to use iron not just to reduce fire risk, but also to cover really large spans. That has to do with railways. The railways as passenger transport appear in the 1820s (the railways as, for example, transport in mines existed long before) and they are so much better than anything else that they spread incredibly fast. They cost a lot: much of the money that people made in cotton goes into them, and then some. They also have to do with iron, in three ways. The first one is obvious: they need a lot of it, which means that a lot needs to be made, which eventually makes it cheaper, which makes it possible to use more of it in buildings. The second has to do with bridges: you need a lot of those, so you start inventing new ways of building them—in iron, because that's the only option that works—and those are later going to help you with buildings. And the third has to do with railway terminals and specifically with the need to cover large spans of tracks from wall to wall. And here again you turn to iron (you could have gone with wooden trusses, as people did in the past on occasion, but you'd be back to having the same fire problems as you had in factory buildings). So in the 1840s engineers develop ways of covering these large spans with iron constructions, and in the 1850s and 1860s you get huge new stations like St. Pancras in London: the sorts of structures not possible before (you use the same technologies for other purposes, too, like greenhouses or large new exhibition halls, which is where they were first used in the 1830s on a smaller scale than in railway terminals).[15]

These are now the 1850s. Half a century later, you have these very new structures for some very specialized cases—but those are exceptions, for now. You also have—and that is much more important—changes to factory buildings, and not just on the outside, but on the inside. Which for our story is important because of what it then makes possible, which is

[15] Sigfried Giedion, *Space, Time and Architecture: The Growth of a New Tradition*, 3. ed., rev. and enlarged, The Charles Eliot Norton Lectures, 1938/1939 (Cambridge, Mass: Harvard Univ. Press, 1954), 177–78.

Stage 3: Growing tall: Offices and the steel frame

This is the third phase of the Industrial Revolution: the Everything Phase. Firms made money in cotton; then they made money in railroads (though a lot less of it, in terms of the scale of profits); and now it was time to make money in everything else. That includes buildings, and it especially—we have now left Britain and are going to the US—includes tall office buildings in New York and Chicago (buildings for industry continued to change, too, but we will catch up with them later). The ways of building that firms will develop for those tall buildings are going to bring us closer yet to one aspect of the box: they are going to make it possible to go up (and up, and up).

Why office buildings? Who *needs* office buildings? Why, all of a sudden, are they coming up in a few cities? And why were they not there before? Well, for one, there is more work of the kind that requires sitting in front of a table inside a room—there is more buying and selling, and more records to keep. Also: buying and selling is happening across greater distances (especially in large countries like the US), which means there are yet more records. And there also are more firms whose main business it is to keep records: say, banks or insurance companies. But why *tall* office buildings, at least in two American cities? Couldn't you theoretically house all these workers sitting at tables at desks in two-story buildings spread all over the country? You could, and in most of the country you would. But not in these two cities: in these two cities, there are too many people who want to be close to each other. Why? Well, they want to be close because business requires interaction and communication. That is the whole definition of it: you are *buying* and *selling*; there are several parties involved. If you do not have good communications across distances, and if you do not have good transport either you want to be physically close to those with whom you do business: a twenty minute walk close, perhaps. Or, as someone who wrote a lot to promote skyscrapers in the 1920s put it:

> The skyscraper facilitates personal contacts in a way never possible before. From my office on the 28th floor of a building in the Times Square district, I can get to practically every person of importance in the architectural and business field in fifteen minutes time.[16]

(Whether the people who paid for skyscraper space thought of that in that same way one cannot tell—but at least some of them probably did). Fine, people want to be close—but why are there a lot of them in these two places? Well, perhaps you just have to have, in any one market, at least some concentration. Maybe it is the property of some people: to think that somewhere there must be a place where more things are happening and to go to that place and in so doing to make it into that place where things happen. Or maybe these are just accidents of history: in a country newly colonized, you have to start somewhere, and people will later concentrate in some of those places. So at the start of colonization you have New York, which is the country's main port and which really grows with immigration, especially with the Irish and the Germans coming in in the 1840s and 1850s.[17] And then a bit later, when you go inland, there is Chicago, which, although incorporated only in 1837, begins to grow really quickly after the 1850s because railways make it possible to do business in America's Midwest. In any event, in these two places you begin to get a lot of demand from a lot of businesses to be close to each other: in New York close to Downtown, where the port is, and in Chicago in the center, inside what will later be called The Loop. And that means that if you are someone who owns land there you want to multiply it as much as possible—meaning, build high.

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[16] Harvey Wiley Corbett, "New Stones for Old," *Saturday Evening Post*, March 27, 1926, https://archive.org/details/the-saturday-evening-post-1926-03-27/page/n151.
[17] Jason M. Barr, *Building the Skyline: The Birth and Growth of Manhattan's Skyscrapers* (New York, NY: Oxford University Press, 2016), 96: "Between 1843 and 1856, 1.46 million Irish and 1.19 million Germans arrived in the United States. A large fraction of them settled in New York." Quoting from K.H. Claghorn, "The foreign immigrant in New York City," Reports of the Industrial Commission, vol. 15, 1901, p. 465–492.

It also means something else, and that is: if you do not own land there you may want to. That is the consequence of the previous rounds of the Industrial Revolution, just like with cotton and railways. You accumulate capital in something, and then that something either no longer takes as much capital (cotton) or does take capital but provides low or no returns (railways, which in the end paid either nothing or 3-5% at best). Then you look for something into which to put your money, and putting it into land (which by now you can buy in the market, which of course you didn't use to be able to) does not seem like a bad idea. Especially because—unlike in industry—you can make the land pay by building something on it for the abstract buyer (the architect Cass Gilbert, in a famous later quote: "The building is merely the machine that makes the land pay.")[18] And that is, first, because people who need offices all have very similar demands: a room, a window, and a desk. And second, because most of them come in small groups—very rarely taking up more than a floor or two even in the biggest buildings—which means that you as the builder or the investor can take the risk of one of them moving out because you can usually find someone else, and quickly.[19] That is not the case for industry, where, first of all, different industries need different sorts of buildings depending on what they do and, second, there are a lot more large-scale setups, at any rate at the time of comparison.

So between the need that is concentrated in these two places and those who want to provide for it with the land that they have and those who want to invest in land and buildings with the money that they have (and some more that they borrow) and the possibility of building for abstract buyers, without having someone in advance who you know actually wants the space (also known as speculation) you get all the conditions to really start making

[18] Cass Gilbert, "Building Skyscrapers," *Record and Guide*, June 23, 1900, https://hdl.handle.net/2027/uiug.30112061683832.
[19] Even in skyscrapers that carried the name of the company that commissioned them as their corporate HQ the company itself would often occupy just a couple of floors; the rest it would rent out.

something new. But: because of the technology that you can use, you cannot really go higher than five-six stories. Now, you *could* build to ten stories, sure—but who is going to walk up to the tenth floor? Plus you do not really have ways of fighting fires high up[20]—so up until about the 1860s you are stuck. You have the rising pressure to build (especially in New York), but no way to meet it. Then two things happen. First, you get the building elevator. Now, elevators in some form have been around for centuries, but they weren't used in buildings until there was something other than human or animal power to run them—which is to say, steam, hydraulics, or electric engines—and until they became safer than before—which meant you wouldn't die if their cables snapped. In brief:[21] in industrial buildings you have hoists already by the end of the 18th century, as in Strutt's 1793-95 Belper West Mill, with power from the main water wheel. That is pretty close to a lift, but of course it still needs a steam engine—regular buildings do not tend to sit on top of rivers. It also needs non-hemp ropes (the hemp ones wear out quickly). The steam engine is around, and you get better ropes by the 1850s (wire ropes in the 1830s, perfected twenty years later),[22] and so you get steam-operated building elevators as well, though they are slow. Around the same time you also get something else, which is advances in hydraulic power, so by the 1870s buildings begin to get hydraulic elevators with vertical cylinders. And then finally in the late 1880s there are the electric ones: W. Baxter Jr. installs one in Baltimore in 1887, and N.P. Otis does a more successful one in 1889. The Otis version becomes basically standard after 1904: the problem of taking people up has been solved.[23]

[20] William Haber, *Industrial Relations in the Building Industry* (Cambridge, Harvard University Press, 1930), 16, http://archive.org/details/industrialrelati0000habe.
[21] Following Haber, 17; Markus, *Buildings & Power*, 281.
[22] Markus, *Buildings & Power*, 281.
[23] For more details, see Andreas Bernard and David Dollenmayer, *Lifted: A Cultural History of the Elevator* (New York, NY: New York Univ. Press, 2014). The book tells the fascinating story of how the Otis Elevator Company helped create the myth of Otis as *the* inventor of the elevator. The myth survives in architectural history books to this day, complete with the account—that probably never happened—of Otis doing dramatic demonstrations of his device's safety, snapping the cables on which it was suspended and triumphantly

But elevators by themselves are not enough. You need a second change: a change in the way that you build. Yes, with the elevator you can go higher up than before, but how high can that be? The answer is, maybe around 15 stories. If you are building out of stone and your walls are bearing the building's load they will just collapse after some point under their own weight (unless you taper the building like a church tower, but then you aren't really multiplying land any more). And even for 10-15 story buildings that you can make stable the walls at the base are going to have to be really thick, and that will take away a lot of the space that you could rent (and the first floor, where various shops would be, would be the biggest loss—thickest walls and rent up to six times higher than on the floors above).[24] Obviously that would not do in places where land is really expensive and is becoming more expensive all the time.[25] You need some other way of building that, first, will let you build with thinner walls at the base for any building that you build and, second, will make it possible to go higher and higher and higher than before for at least some of your buildings. And that finally becomes possible thanks to some of the work that had been done in industry and railways. It is a long story of people trying different things in different buildings:[26] both in terms of engineering solutions (as with different systems of bracing) and in terms of materials (as with switching to steel). Steel is particularly important: you begin to get a whole lot of it in buildings after the 1880s (the consequence of the Bessemer process, which was invented in the late 1850s but took some time to take off because of problems with the

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exclaiming, "All safe, gentlemen!" (the account appears in Giedion, *Space, Time and Architecture*, for instance).

[24] Carol Willis, *Form Follows Finance: Skyscrapers and Skylines in New York and Chicago* (New York, N.Y: Princeton Architectural Press, 1995), 189.

[25] Barr, *Building the Skyline* reports on p. 310 that in Manhattan "in 1879, following the crisis of 1873, prices Downtown averaged about $25 per square foot. At their apex in 1890s they were near $200." That was a lot of money to lose out on.

[26] For the US, a richness of details for America is in Carl W. Condit, *American Building: Materials and Techniques from the First Colonial Settlements to the Present* (Chicago, University of Chicago Press, 1968), http://archive.org/details/americanbuilding0000cond.

technology).[27] What is important is not just what steel can do—say, be less brittle than cast iron and harder than wrought iron—but also that it is cheap (which was mostly because you could produce it in large billets that you could then roll into whatever members you needed—even if it meant that, compared to casting, your members had to be much more standardized than before).[28] Building with it is fast, too: a building that would take two years to build in masonry takes a year with a steel skeleton.[29] So you get the first steel frame in 1889; then in 1890 you add the electric elevator to it in the Waldorf Astoria Hotel in New York[30] and from there on you either can go up and up and up and make a lot of money by multiplying land many times over or make a little less money but still decent amounts of it with buildings that are lower by making their walls thinner (it also helps that you can move interior partitions later if you need to reconfigure them when tenants move).

The real estate industry—and this is now becoming an industry—really takes this up, and buildings go taller and taller and taller—but within the constraints of what makes the most money (there are whole treatises on the height to which one should build to make the most money).[31] In the 1930s, for example, Empire State building is almost exactly as tall as it is because the people who funded it thought that it was going to give them the highest return

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[27] W. H. (William Henry) Chaloner, *People and Industries* ([London] F. Cass, 1963), 77, http://archive.org/details/peopleandindustr0000unse.
[28] Rowland J Mainstone, *Developments in Structural Form* (London: Routledge, 2005), 59.
[29] Haber, *Industrial Relations in the Building Industry*, 19, adding that "the amount of the overhead charges, taxes and interest on the steel building is between 4 and 5 per cent; on a masonry construction it is between 12 and 15 per cent."
[30] Haber, 19.
[31] "An influential, widely discussed… book of the period was W. C. Clark and J. L. Kingston, *The Skyscraper: A Study in the Economic Height of Modern Office Buildings* (New York: American Institute of Steel Construction, 1930). Clark was a vice-president of S. W. Straus, the mortgage bond firm that financed the development of many skyscrapers, including the Chrysler Building, and Kingston was a commercial architect with Sloan & Robertson. The authors chose a hypothetical example of a site near Grand Central Station to demonstrate that a seventy-five-story building yielded a greater return on investment than smaller structures, thus arguing for skyscrapers as the most economically efficient use of urban land in districts with high property values. The best efforts to critique Clark and Kingston's pro-skyscraper arguments were by George Ford, *Building Height*, and Thomas Adams, *"Character, Bulk, and Surroundings of Buildings."* For further debate, see Chamber of Commerce of the United States, *Economic Height of Buildings* (Washington, DC, 1927)." Marc A. Weiss, "Density and Intervention: New York's Planning Traditions," in *Landscape of Modernity*, ed. David Ward and Olivier Zunz, Essays on New York City, 1900-1940 (Russell Sage Foundation, 1992), 73, www.jstor.org/stable/10.7758/9781610445504.8.

on their capital (strictly speaking, they thought that they would get the highest return by building a few stories lower but built as high as they did so they could get, at not too much of an extra cost, the title of the world's tallest building; the calculations did not work out when the Great Depression came, but that is beside the point).[32] At any rate: you can build tall, and you do. And you *wish* you could build the pure box as you do it, too: as a 1931 study puts it, "The rectangular prism remains the most economical framework for a building."[33] The reasons for that are that if you go horizontal before you go vertical you, first, need fewer elevators, which means their shafts take less space; second, need a less robust building frame (gravity works against you as you go taller, and so do winds, which after some point begin to require additional bracing—especially if your building towers above others nearby); and, third and fourth, you might save on the costs of exterior walls and maintenance, as the following quote makes clear:

> The block building is also more economical to build and operate. Exterior walls are the most costly parts of any major structure. The larger the area of a building's floor, the less exterior wall will be required to enclose it. For instance, if a plan is 50 feet square, it contains 2,500 square feet of space, and its exterior wall is four times 50, or 200 linear feet. It thus contains 12.5 square feet for each foot of wall. But if the floor is 100 feet square, it contains 10,000 square feet of space and the exterior wall is 400 linear feet, or 25 square feet for each foot of wall. So the 100-foot-square building takes only half as much exterior wall per square foot of rentable area as the 50-foot-square building.

[32] The whole fascinating story can be found in Willis, *Form Follows Finance*, p. 90–101; the studies Willis cites on determining the height that will give the investor the highest return are George Hill, "The Economy of the Office Building," *Architectural Record* 15 (April 1904): 326; C.T. Coley, "Method of Checking Economical Height of Office Buildings," *Buildings and Building Management* 13 (July 1913): 41-47; and, in later years, R.H. Shreve, "The Economic Design of Office Buildings," *Architectural Record* 67 (1930): 352 and W.C. Clark and J.L. Kingston, *The Skyscraper: A Study in the Economic Height of Modern Office Buildings* (New York: American Institute of Steel Construction, Inc., 1930)

[33] Regional Plan of New York and Its Environs, vol. 2, The Building of the City (New York: RPNYE, 1931), p. 192. Quoted in Weiss, "Density and Intervention: New York's Planning Traditions," 68.

> There are other important savings. As heat losses are proportional to the area of the exterior walls, the cost of heating and air conditioning will be approximately 50 per cent less per square foot of floor area in the larger building. Window cleaning and maintenance of the exterior wall will be in proportion.[34]

But despite all this, you still don't build the "rectangular prism"—the pure box—for which there are several reasons.

Reason one is light, as in daylight. You obviously need a lot of it for office work. You have some artificial light, true, and it is better than what you had a century before—early electric lamps instead of oil or gas ones—but it is still weak enough that it only works—barely—as table lamps. And if it is not weak then it gets so hot that it really becomes a problem in small rooms (think 500 watt bulbs). So you have to, first, have big windows and tall ceilings and second, not make your floors too deep—probably not deeper than 8-10 meters from the windows to the elevators in the center. You of course could build deeper than that, but the cost per square meter is the same and the rates that tenants pay are maybe half of what they'd pay near a window so your rate of return really falls.[35] As the same 1959 book that argued for the benefits of block buildings put it,

> An efficient floor plan is not the plan that gives the largest amount of space on the lot, but one that produces the largest amount of light space that will command the highest rate per square foot. As an illustration, if a plan produced all street space 20 feet deep, it would in the 1920s have brought an average rental of $2.80 a square foot. If the space cost $15 a square foot, this would be 18.65 per cent of the investment. However, if the space were 50 feet deep, with an average rental value of only $1.65 a square foot, the percentage return on the $15 cost would be 11 per cent, or only 60 per cent as much.

[34] Earle Shultz and Walter Simmons, *Offices in the Sky* (Indianapolis: Bobbs-Merrill, 1959), 248, https://hdl.handle.net/2027/mdp.39015020399435.
[35] Willis, *Form Follows Finance*, 26.

> One reason why so many of the early office buildings earned such a low net return was because they contained an excessive amount of deep and poorly lighted space.[36]

All of which means that—at least if you are a smart developer—if you have a plot that is bigger than, say, 30x30 meters instead of building deep you start putting in light courts: build in the shape of an O or an H, for example.

Reason two: government. Even if you have a relatively small plot on which it is possible to build something boxlike there are still things that you cannot do. Those are different in Chicago and in New York. In Chicago there is an absolute height limit until 1923 (starting with 130 feet in 1893, going to 260 in 1902, to 200 in 1911, and to 260 again in 1920);[37] after 1923, one can build above the limit, but is still limited by volume that one can have above it (no more than one sixth of what is below). In New York you can go as high as you want up till 1916; after 1916, you have to start pushing your walls back once you go taller than some proportion of the width of the street, and the higher you go the more you have to do that, so you get ziggurats (city laws from 1916, which the city passed because some buildings became so big that they took all the light from their neighbors and which the real estate industry did not oppose too much because they wanted to put some limits on building after a recession in the early 1910s).

And reason three is the taste of your clients. Even if you were building on a small plot on which you could put a height-limited pure box you would not. That is because you were building not for yourself (usually) but for someone who would rent from you, and those people—most of them with quite a bit of money, because you are building on some of the most expensive land in the world—had their ideas about what buildings for commerce should look like, which ideas, at the time, usually had something to do with words like

[36] Shultz and Simmons, *Offices in the Sky*, 134.
[37] Willis, *Form Follows Finance*, 109–11; Willis, 195.

"beauty" or "grandeur" (there is a reason why so many 19th century banks in the US look like Greek temples). All of which is to say that you were going to have to put in some decoration. Cass Gilbert, in the same paragraph in which he describes office buildings as "the machine that makes the land pay," continues:

> The more economical the machine both in construction and operation, provided it fulfills the needs, the more profitable the land. At the same time, one must not lose sight of the fact that the machine is none the less a useful one because it has a measure of beauty, and that architectural beauty, judged even from the economic standpoint, has an income-bearing value."[38]

Sure, there are debates among architects about how much decoration you should or should not have (and we'll get to those later), but the effect of that on what actually gets built in the US up till WWII is minimal. The clients just wouldn't take it. So you have—as late as 1928—the German-American architect Walter Curt Behrendt complaining (about Europeans, but he could equally well have said it of the Americans; it is worth quoting him at length):

> It is now apparent that it is precisely they [the clients]—those who in every respect and for every reason must be the most conscious promoters and most active champions of the new building attitude—who are the most restrained and impeded by false prejudices. In their professional lives these clients (entrepreneurs, factory owners, bankers) are the most unbiased, the most progressive, and the most modern people. They head the most modern companies; they ride to their offices in turbocharged Mercedes automobiles; they travel by plane to their business conferences; they receive their stock reports over the wireless; and now they even place their orders by telephone from a moving express train. In everything pertaining to their profession,

[38] Gilbert, "Building Skyscrapers," 1085.

> they think factually, rationally, and without prejudice. As soon as they speak of art, however, they become sentimental and think of Nuremberg, Venice, or the Petit Trianon.
>
> They doggedly persist in the ingrained superstition that art is synonymous with decoration. Thus they dress up their factories like medieval fortresses; they build their banks like sumptuous Renaissance palaces; they build their villas like Baroque castles. Even though they make extensive use of every technical advance everywhere else in their lives, they are surprisingly content to live, work, and dwell in houses in which no trace of the transformed living conditions can be seen.
>
> When will clients finally understand the spiritual discrepancy between their Louis XVI salons and their Rolls Royces?[39]

It would take the clients some more time, though not too long. All in all, by the 1930s, office buildings are pretty close to pure capitalism: to buildings as square meters in relation to money, which is to say, to a pure box. But as late as the 1930s they—because of what the client expect and most architects are used to—still have all these elements that are strictly speaking not necessary (in a cosmic sense, that is—given what everyone knows the prime objective is, which is to maximize the return on investment). To get closer to the proto-box we have to go somewhere where there are fewer constraints. That—again—means industry.

Stage 4: Growing strong, again: Industry, reinforced concrete, and the proto-box

Office buildings change, and industry changes, too. Factories first start to use brick and steel construction; later, just like office buildings, some of them use full steel skeletons. But they are not switching to steel as uniformly as tall office buildings are: the need just is not that

[39] Walter Curt Behrendt, *The Victory of the New Building Style*, Texts & Documents (Los Angeles, Calif: Getty Research Institute for the History of Art and the Humanities, 2000), 141–42, https://modernistarchitecture.wordpress.com/2010/10/19/walter-curt-behrendt%e2%80%99s-the-victory-of-the-new-building-style-1928/.

great. In the late 19th century, you cannot build a tall office building in any way other than steel. You *can* build a factory in lots of ways, of which steel is only one. Yes, it can cover greater spans than, say, timber—but by itself it is less fireproof than heavy timber, so you need to clad it in something that will protect it from the fire, which of course makes it more expensive. So for a lot of buildings you can very well continue using slow-burn timber construction: timber is known, and cheap enough.[40]

But around 1900 you begin to use a material that almost all new factory buildings are going to rely on for several decades from then on. That material is reinforced concrete. Concrete has been around in some form for ages (since the Romans, actually), but it was unreinforced, which meant that it could not do something that brick and stone could not do as well (unless we are talking about specialized uses like building underwater).[41] *Reinforced* concrete *can* do a lot of things that no other material can do: like wood and steel, you can use it in both compression (when it is a column or a wall) and in tension (when it is a beam, which you cannot do with unreinforced concrete because, like brick or stone, it will crack). Unlike wood and steel though, it does not fail in a fire. And, of course, you can use formwork to pour it in such a way that its shape will best match the forces that it is going to encounter, which is really helpful when building things like dams or bridges, though that would take some time to figure out. The beginnings are much more modest: some of the first experiments in the 1850s and 1860s work on flower pots (really).[42] Then you move to floors (the French builder Francois Hennebique, in the late 1870s), and then you start experimenting with structural members: columns and beams. You begin to get commercially viable options by the late 1880s: in Europe, the best-known man is

[40] Willard L. Case, *The Factory Buildings* (New York, Industrial Extension Institute, 1919), 256–57, http://archive.org/details/factorybuildings00case.
[41] C. J. Brandon et al., *Building for Eternity: The History and Technology of Roman Concrete Engineering in the Sea* (Oxford ; Philadelphia: Oxbow Books, 2014) has the fascinating details for the case of the Romans.
[42] See Condit, *American Building*, 168–72, for a general overview.

Hennebique; in the US, it's Ernest Ransome, who works in California, where reinforced concrete also helps with earthquake risk. You have some initial skepticism among the builders about the new material: they first start to use reinforced concrete for floors within the more familiar steel skeletons. But then there is a massive steel shortage in the US in 1897 and 1898,[43] and architects and engineers have little choice but to use reinforced concrete more than before. By 1905 or so, you begin to get a new type of factory: one in which the whole frame is made of reinforced concrete, and so are the floors.[44] And that frame becomes a really popular option: slowly at first, and much faster after about a decade.

Why the popularity? The main reason is fire. Factories built with reinforced concrete basically do not burn. Their contents do, of course, but the structures themselves survive.[45] The structures survive to such an extent that some owners eventually stop paying for fire insurance;[46] and even those who did still pay paid a lot less: the rates per $100 of value were $0.75-1.5 for wood mill construction with wood sides; $0.20-0.75 for wood mill construction with brick sides, and $0.10-0.40 for concrete construction.[47] You had other reasons to use it, too.[48] First, there was less vibration from machines so you could have more stories; second, you could have fewer columns inside than before, which was good for light; third, you could have much larger windows—the entire wall could be windows (which got to be called 'daylight factories')—which was even better for light; and fourth, you could make the whole building really large.

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[43] Haber, *Industrial Relations in the Building Industry*, 21.
[44] Albert Kahn's Packard Factory #10 is the famous early example, often cited as the first in the car industry—even though that is not the case; see Michael G. Smith, "The First Concrete Auto Factory: An Error in the Historical Record," *Journal of the Society of Architectural Historians* 78, no. 4 (December 1, 2019): 442–53, https://doi.org/10.1525/jsah.2019.78.4.442. Kahn's brother Julius started building industrial structures with his system of reinforced concrete already by around 1903.
[45] Case, *The Factory Buildings*, 268: "This is a structure of the best fire-resistent type; it is as nearly fireproof as any building may be made."
[46] Biggs, *The Rational Factory*, 83.
[47] H. G. (Henry Grattan) Tyrrell, *Engineering of Shops and Factories* (New York, McGraw, 1912), 54, http://archive.org/details/engineeringofsho00tyrruoft.
[48] Following Biggs, *The Rational Factory*, 83.

It took some time to take reinforced concrete up at scale: you had some issues with cost, a lot of which was in formwork, which required skilled labor. But you dealt with it over time—for example, you started using more precast members, especially for floors. The result is that "by 1910 concrete construction had become extremely popular in the United States: it was an exciting novelty, and enthusiasm for it paralleled the earlier passion for cast iron."[49] You get a lot of experimentation, especially among people with money, which around these years includes those who own car factories. So Albert Kahn, who built the Packard Factory, builds a whole lot more with his brother Julius, mainly for Ford and becomes one of the most famous industrial architects of the age.[50]

In this process you begin to get proto-boxes sometime in the 1910s. You could call Kahn's buildings that to some extent, but those are prestige projects, and that means that whoever builds them usually give some thought to what they look like. Ford's Highland Park factory, from the early 1910s (which Kahn designed), had more chimneys than necessary—five—so you could fit the letters F O R D between them.[51] As with the Gilbert quote above—one that said that beauty has an income-bearing value—you often talked about what your buildings looked like in economic terms. The arguments you find at the time are along the lines of:

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[49] Condit, *American Building*, 241.

[50] You could technically use reinforced concrete in office buildings as well, but that would be a story for the later decades of the 20th century. The first tall building—the sixteen-story Ingalls (Transit) Building in Cincinnati (Condit, *American Building*, 241)—was built with reinforced concrete in 1902-3, but most buildings taller than that were still built with steel up until the 1960s, the main reason being that it was expensive to get concrete high up and impossible to get it higher. That got solved in the 1960s once powerful concrete pumps were invented. Nowadays builders use both steel and concrete frames; what you choose depends mostly on its cost at the moment of building—steel and cement can both fluctuate a lot in price. What appears in Haber, *Industrial Relations in the Building Industry* in 1930 (22) is still mostly true: "The determining factor in the choice between reinforced concrete and steel is cost, the former running from 10 to 20 per cent lower than the fireproofed steel construction. The choice is also affected by the cost of transportation, by availability, type of labor supply, particular purposes of use and personal preferences. Building with concrete is more subject to climatic handicaps than that with structural steel, but an elaborate technique of preparation and protection has been developed, which makes it as certain and safe as any." That said, after 9/11 there seems to have been a shift towards reinforced concrete as the safer choice in the event of a fire—the Twin Towers failed not because of the impact of the planes but because the fires from the jet fuel melted their steel cores. The cores were clad with a fireproof material—gypsum board—but the impact was strong enough that it did not help.

[51] Freeman, *Behemoth*, ch. *4*.

beauty pays, beauty makes your workers work, beauty is advertisement, beauty is good for business. As in this quote, for example:

> The effect of approaching and entering a well-grouped and dignified building has also an influence on the workers that tends towards happiness and better production, and although advertisement and psychological effect on workers have been but little considered in this country [Britain], they are in America realized to be of great importance.[52]

And then, of course, you just had the freedom of doing something because you liked it: non-economic reasons; reasons of status; reasons to put your name up in giant letters for all to see.

But: all of that matters a lot less in second-tier buildings, which is to say in those that are not about prestige; in those that are just about getting things done; in those that are somewhere far enough away from where anyone would care about what they look like. There are thousands of them all over the United States, enough that Moritz Kahn—Albert's father, also working in buildings—had to argue in 1917:

> In this country, people are accustomed to think that appearances are of little consequence in so prosaic a place as a factory. It is even taken for granted that ugliness in a factory building is inevitable. But there is really no necessity why factories should be ugly. Many of them, indeed, treated with architectural skill, are extremely imposing, and all might be at least presentable.[53]

[52] Ernest George William Souster, *The Design of Factory and Industrial Buildings, with Chapters on Welfare Work and Industrial Research Departments* (London, Scott, Greenwood & Son, 1919), 100, http://archive.org/details/cu31924015429503.
[53] Moritz Kahn, *The Design & Construction of Industrial Buildings* (London: Technical Journals Ltd., 1917), 47, https://catalog.hathitrust.org/Record/102064269.

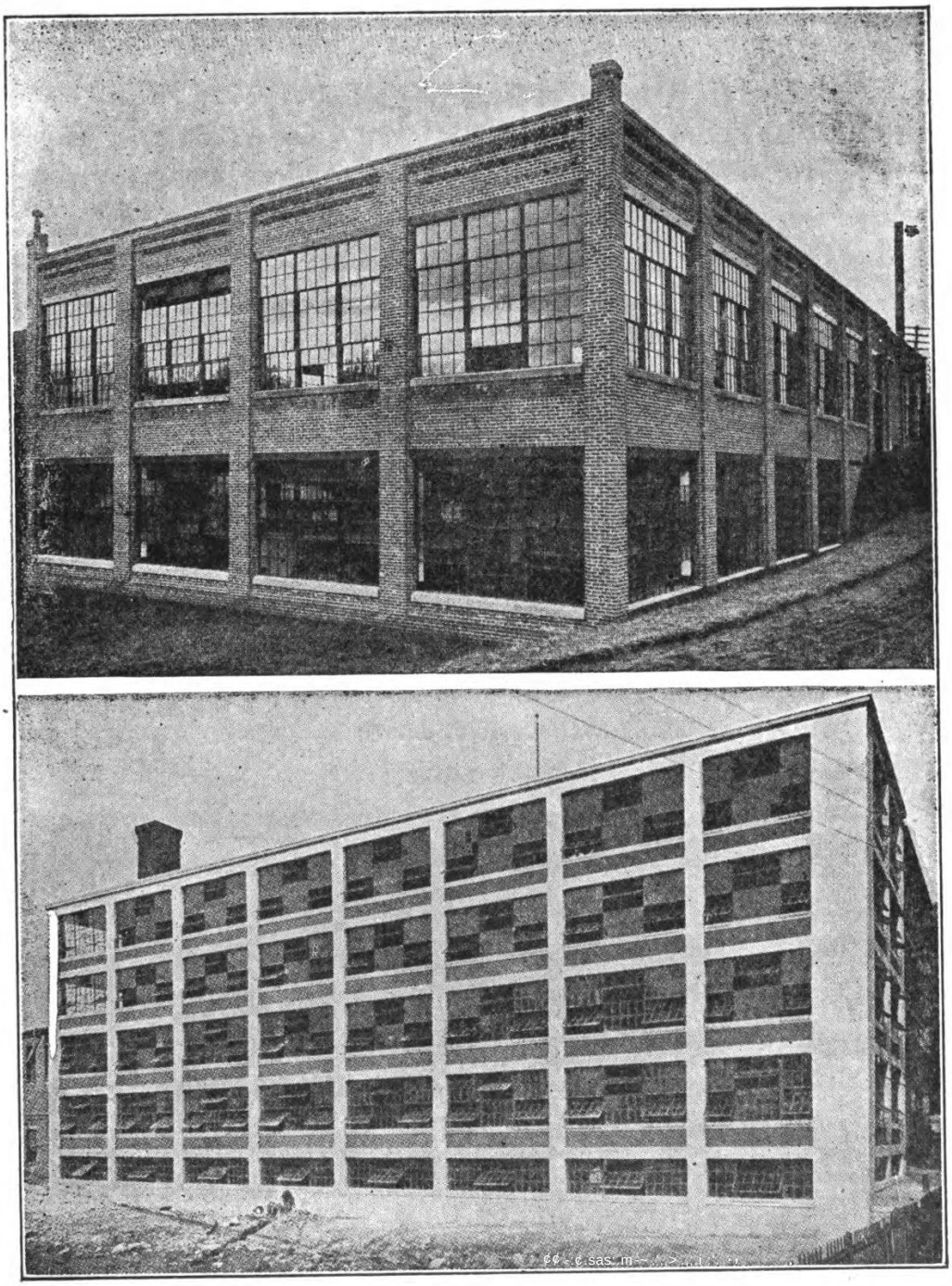
All those ugly buildings came in for criticism, sure. Here is a quote from 1919, comparing one building to another that "made an honest attempt for a pleasing exterior":

> [the figure] also illustrates an honest design, in that this factory building boldly cries out that both the owner and the contracting-engineer neither cared a whit about the beautiful nor had any money or time to spend in seeking architectural advice, nor even sufficient ambition to attempt an effort to utilize the strictly utilitarian in a pleasing way.[54]

This, mind you, is by the same person who, not to be accused of sentimentality, earlier writes that "factory buildings… are vital elements of the manufacturing plant of which they are a part, and the primary purpose of which is profit. Properly designed, well constructed, and adequately equipped they are instruments of real earning power."[55] How things would later change.

On the bottom of the figure that the quote refers to you really do have the proto-box. This is a building probably in the middle of some American nowhere (the book does not mention what this building is or where it stands), where the buildings of the new era, of profit-maximizing firms competing in large markets, of thinking of buildings as an expense, as square meters in terms of money, shaped and regulated, too, by governments and insurers, come into their own. The only thing they need is a stamp of prestige so writers stop making fun of them—and that they will get. From here on it's onwards to global victory by a path to which we now turn.

[54] Case, *The Factory Buildings*, 262.
[55] Case, 251.



FIGS. 58 AND 59. AN HONEST ATTEMPT BY THE OWNER FOR A PLEASING DESIGN (above). NO EFFORT BY OWNER OR ENGINEER TO EFFECT A PLEASING EXTERIOR (below).

Figure 3 The proto-box (below), circa 1919 (in Case, Factory Buildings, *261)*

The first success: The box as one of the solutions to Germany's housing crisis in the 1920s and early 1930s

Let us go the 1920s now, to Germany. And in Germany in the 1920s something really unusual and really important happens—well, important, at any rate, for our story. And that is that someone builds the pure box, and quite a lot of it, too. And not in industry, mind you, where there was more or less a clear need for it at least in some cases, but in housing, where the need for the box—as opposed to the need for housing in general—was not clear at all. Nonetheless, between 1925 and 1930 you get tens of thousands of units of housing for the poor in buildings that really do look like boxes, and you also get a lot of coverage of them in the press, which later helps the box become something that one can build not just for second rate factories or housing for the lower classes but for the more important sorts of buildings as well.

How does German housing in the 1920s lead to the box? Four conditions had to come together. First, there had to be a really big need for housing. Second, there had to be a government that was going to pay for it. From these two followed the third: one had to build as much as possible as quickly and cheaply as possible. And finally there was the fourth condition: there had to be people around who by the time the money for building became available had spent much time thinking and writing and exhibiting about buildings—including housing—in the way that they thought was going to deliver on the third condition, which was the way of the box. Germany in the twenties was the only country in the world that had all four of these conditions—and because it did, some municipality or another was going to decide to let the architects of the box do its housing, which some in fact did. Let us see how that happened—and to make the point clearer, let us also compare the preconditions in Germany, where some housing was built in the way of the box, to those in

England, where it was not because, although the first three preconditions were the same the last one was not.

A brief prehistory of the need for housing and the attitude of governments towards it

Before we talk about housing, let us quickly understand how it became something that governments did something about. The need for mass housing is an old story—as old as people moving in large numbers to cities when their societies become industrial (whether because they want to move or were made to move or both). At the heart of this need—which standard economic theory would tell you private builders should meet because they want to make a profit and would therefore build houses for those who need them—is the fact that in a society in which people only have housing if they can pay for it to someone who wants to make a profit out of it (those private builders) there will, in proportion to how unequal such a society is, be those who cannot pay enough, for which reason those builders will not build for them. Therefore, those people will have bad housing, if they have it at all.

Now, if housing is a problem just for those who do not have it they can be ignored for quite some time—but in the beginning of the housing problem, which is to say, in the 19th century (in different decades of it in different European countries), it is also a problem for the rich in ways that it is not right now and has not been for some time (for which reason it became easier to ignore). And the issue is that the poor live right next to the rich in such terrible conditions—children playing among heaps of human excrement—that their diseases can get the rich, too. Therefore the rich—and the governments that represent them—have to do something about it. That they do at first with the tools of health, which is to say, they pass health standards and make it possible to tear down the worst buildings. But that does not help much: more people keep coming to cities, and the boom in the building of railroads makes it all worse yet because railroads are taken to city centers through the areas where the

poorest live, which means more demolitions and even less housing. Eventually the governments realize that there really are only two things that they can do about the 'housing problem,' as it is becoming known in the later 19th century, both of which have to do with taxes. One is to use taxes broadly to make society less unequal; the other, to use taxes narrowly to pay for the housing of those who cannot otherwise afford it (as Lord Salisbury put it in a report in 1883 with the directness that one does not often see in contemporary debates on housing, "Where the difficulty arises from the wages being too low to pay the bare cost of providing lodging, it is evident that so long as wages remain at this level it is not possible that through existing agencies, at least, relief can be afforded by any expenditure that assumes to be a remunerative investment.")[56]

The option of making society radically less unequal the governments, of course, do not really consider (they still have a hard time doing it in most places). But they do move—however slowly—towards the second option of using tax money to pay for the housing of the poor. In England for example it happens in the late 1880s: two Housing of the Working Classes Acts (one of 1885 and the other of 1890) start allowing local councils (municipal governments) to build directly for the poor instead of just demolishing buildings that were no good. In Germany it happens as well, though in a different way: there, the state does not work with municipal governments but instead encourages privately formed housing cooperatives and, in 1890, makes it possible for them to borrow money from regional social insurance boards.[57] Other countries and cities act later, in the years just before WWI: Vienna, for example, or Paris; others, before WWI, do not act at all—Brussels is a good example of expecting the workers to solve their own problems however they see fit

[56] Robert Gascoyne-Cecil 3rd Marquess of Salisbury, "Labourers' and Artisans' Dwellings," *The National Review* II, no. 9 (November 1883): 314.
[57] M. J. Daunton, ed., *Housing the Workers, 1850-1914: A Comparative Perspective* (London ; New York: Leicester University Press, 1990), 231.

(including by getting out of city centers now that transport is becoming cheaper and faster).[58] But even those governments and cities that start to build for the poor do not do it at a scale that is large enough to actually solve the problem: there are a lot of poor people and to build for them all would mean, first, to tax the rich more and, second, (and probably more important) to set an example of governments taking care of the poor in ways that might later lead to other demands.

This changes after WWI, even if just for a few years—and that is because the problem becomes so bad that it becomes hard to ignore. The reason for that is that in countries that were at war a lot of people moved to cities to work for war industries and therefore needed where to live—and there was almost no construction going on during the war to meet that need. What is worse, for governments, is that this is no longer an issue of public health: it is also—because of how many people need a place to live and because of what is happening in places like Russia—an issue of possible revolution. In Germany there is, of course, a revolution (in which housing is a prominent theme) that puts in power—for some time—the people who are less interested in representing the rich than previous governments were and who are prepared to pay for housing for those who need it. In Britain there isn't a revolution, and the people in government are the same old representatives of the rich, but the British look at Germany and think that there very well may be problems when five million former soldiers come back home and ask what it was that they had fought for (and that in that case the municipal police might not be enough to put them in their place). So the British, too, decide to fund housing because, as the Parliamentary Secretary to the Local

[58] Daunton, *Housing the Workers*, has the accounts for several different cities

Government Board put it in April 1919, 'the money we are going to spend on housing is an insurance against Bolshevism and Revolution.'[59]

Now the English actually start spending before the Germans do: theirs is the economy not destroyed by the war so they quickly—in late 1918—authorize massive spending and promise to build, within three years, 500,000 houses that are, in Lloyd George's words, "fit for heroes to live in" (which, by the way, is a very high figure considering that before WWI the private industry was building maybe 80,000 houses a year at most).[60] The Germans do not act quite as fast: for them, 1918-1923 are the years first of inflation and then of hyperinflation so there is not much investment going on in anything at all. They do, to be sure, lay the groundwork: the Landtag in Prussia passed a law in 1918 that guaranteed "the right of every citizen to a sound dwelling within his means."[61] The law did two things: promised loans to cooperative building societies (of the sort that had been set up in the 1890s) and required municipalities to set up offices to oversee public housing planning and financing. The federal government took this over in 1918, wrote the right to housing into the new constitution, and also passed minimum dwelling standards—but the actual funding had to wait until 1924. By then, the currency stabilizes (with quite some help from the Americans under the Dawes Plan) and the government passes a special tax on rental housing called the *Hauszinssteuer* specifically to fund housing construction. Hyperinflation actually is what makes it easier to pass this tax in the first place: because of how much the mark depreciated, those who had mortgages paid them off very quickly and had extra money that the government could take from them, which it did. Both those from whom the money was now taken and those to whom the money had been owed could complain—the former

[59] 114 House of Commons Debate, 8 April 1919, col. 1956 (W. Astor). Quoted in Mark Swenarton, *Homes Fit for Heroes: The Politics and Architecture of Early State Housing in Britain* (London: Heinemann Educational Books, 1981), 79.
[60] Swenarton, 122.
[61] Barbara Miller Lane, *Architecture and Politics in Germany, 1918-1945* (Cambridge, Mass: Harvard University Press, 1985), 88.

because it was taken, the latter because they were never compensated—and complain they did. But it is hard to ask to get back something that one had already lost by an accident of history and harder yet to ask to *keep* something that one got through that same accident than to resist, in more usual times, either a new tax or an increase in the national debt. So there was money in Germany, too (even though by the time the Germans got their funding in place the British wrapped their program up: they stopped funding it in 1921 with 175,000 houses built out of the promised 500,000 because they decided that the threat of revolution had passed, which it had).

The problem of building quickly and cheaply

Money was nice to have, but there was a problem. True, the funding in both places was very large by the standards of how little the governments had spent on housing before—but it was still not enough. In fact, in Britain the government admitted, internally, that the real purpose of building even 500,000 houses was not to actually solve the deficit but rather let the people see that the government is doing something for them (Lloyd George: "We had promised them reforms time and again, but little had been done. We must give them the conviction this time that we meant it, and we must give them that conviction quickly").[62] This obviously means that whatever money is available should build as many houses as possible as cheaply as possible—and as quickly as possible, too (though with the caveat—especially in England—that there has to be a minimum standard met, and that that standard has to be higher than the standard of private builders before the war—so, for example, the houses can have a bath).

[62] See Swenarton, *Homes Fit for Heroes*, p. 85 for the argument and p. 78 for the Lloyd George quote, which is from UK Public Records Office CAB 23/9 WC 539 (3 March 1919)

Except there is another problem: and that is that there hadn't been much progress in housing technology throughout the 19th century. There was progress in *building* technology, sure, but that applied mostly to areas where developing that technology could make someone a lot of money, which is to say, in industry and in offices, of which we spoke in the previous chapter. There was far less money to be made in housing and most certainly no money to be made in housing for the poor, so most housing continued to be built in perfectly traditional ways, which meant that the cost of it did not change almost at all. In Britain, for example, a few of its components—glass, paint, lead, cement—did become cheaper between 1845 and 1914 but others—timber, stone, tiles, bricks—became more expensive, which did mean a 30 percent drop in the overall cost of materials except that that drop was offset almost exactly by the increases in the cost of labor.[63]

This meant that houses were ripe—or so some people thought—for some innovation. At which point the question became: what kind of innovation is it that gets you lower costs? This is where England and Germany separate. Of course, there was a sense in both places that the answers would somehow have to do with industry and mass production and standardization, but in England you had an approach that you could call evolutionary: lots of experimenting but nothing too radical (changes of plans and experiments with materials, for example). An important British government document—the Tudor-Walters report of 1918—argued that

> So far no revolutionary developments of materials or processes had been evolved that were likely to result in sensational changes in the character of housebuilding, but that there were a number of suggestions in many branches of the work which deserved investigation; that, in fact, the whole of the processes called for review, in the hope that

[63] Richard Rodger, *Housing in Urban Britain, 1780-1914: Class, Capitalism, and Construction*, Studies in Economic and Social History (Houndmills, Basingstoke, Hampshire: Macmillan, 1989), 20.

> a number of improvements and economies might be found, the accumulated effect of which might be considerable, though individually they might seem to be small.[64]

In Germany you obviously had some of that evolutionary spirit, too, but you also had people who wanted to push much farther than gradual experimentation: in fact, into a direction that you could call revolutionary—or at the very least highly experimental. This experimentation focused—of course—on industry and machines, and it did it in two main ways, or maybe through two main ideas. The first idea had to do with the economics of mass production, and it was that because industry had lowered the prices of many material objects it should also be able to do that for buildings—including housing. And the second idea was indirect, metaphorical: and that was that in an age of the machine what buildings look like should have something to do with machines, too.

The first idea—of mass production—was not difficult to come up with in the 1910s. First of all, a lot of material objects did become much cheaper than they used to be, and second, there was also a lot of talk about the latest ways of making things cheaper: Fordism, Taylorism, America were all over the news and there was a fascination with those ideas in Europe that is hard to imagine today (even Lenin sang Taylorism's praises at some point). In 1910, Walter Gropius—who will later become one of the most important architects of the box—even proposed to his employer, Emil Rathenau of the industrial giant AEG, to establish a company that "sees as its aim the industrialization of the building of houses, in order to provide the indisputable benefits of industrial production methods, best materials

[64] Local Government Board, *The Tudor Walters Report* (London: H.M.S.O., 1918), paragraph 177. Quoted in Swenarton, *Homes Fit for Heroes, 108.*

and workmanship, and low cost"[65] (Rathenau never responded, but the idea was nonetheless there).

The second idea—the metaphorical one—maybe had something to do with a general sense at the end of the 19th and beginning of the 20th century (among some architects, at any rate) that architecture had gone the wrong way throughout the 19th century because there was a very big mismatch between what the age could do with its technology in a general sort of way and the buildings that it produced with that technology. The technology was not like anything that had come before, but the buildings were mostly imitations—of Greeks, of Romans, of Egyptians, of anything and everything—and not very convincing ones either. Therefore, some people thought, one should look for a 'style appropriate to the age,' which they started looking for already in the early 19th century. In Germany, there was even a debate in the 1830s that later became known as "In What Style Should We Build"—with no clear resolution back then except to point, in a vague way, to the possibilities of new materials like iron and glass.[66] That, in fact, is what happened: as technology developed and accomplished ever more impressive things, some architects began to find inspiration not just in new materials (to which steel and reinforced concrete are added later in the century) but in all things machine and industry-related in general. That they sometimes expressed in poetic terms (like the Italian futurists talking of the glory of speed) and sometimes in very straightforward economic terms (as Loos wrote in his famous Ornament and Crime, "omission of ornament results in a reduction in the manufacturing time and an increase in wages"—or, Loos should have added, profits to the owners; he also wrote much else in that

[65] Walter Gropius, "Program for the Founding of a General Housing-Construction Company Following Artistically Uniform Principles," in *Housing and Dwelling: Perspectives on Modern Domestic Architecture*, ed. Barbara Miller Lane (London ; New York: Routledge, Taylor & Francis Group, 2007), 237.
[66] See Heinrich Hübsch and Wolfgang Herrmann, eds., *In What Style Should We Build? The German Debate on Architectural Style*, Texts & Documents (Santa Monica, CA: Getty Center for the History of Art and the Humanities, 1992).

essay besides different parts of which later ages quoted as they saw fit). They also get inspired by factories directly: as Gropius wrote at some point,

> Compared to other European countries, Germany has a clear lead in the aesthetics of factory-building. But in the motherland of industry, in America, there exist great factory buildings whose majesty outdoes even the best German work of this order. The grain silos of Canada and South America, the coal bunkers of the leading railroads and the newest work halls of the North American industrial trusts, can bear comparison, in their overwhelming monumental power, with the buildings of ancient Egypt.[67]

To be sure: the first idea—that building cheaply requires industrialization—did not automatically lead to the second, much less to its extreme expression as the box. True, the machines of the time did tend to favor straight lines and flat surfaces, but it was never clear that using those straight lines and flat surfaces to assemble something as severe as the box was actually going to make buildings cheaper (Gropius experimented with flat roofs and buildings assembled like Lego blocks, but the British, around the same time, thought that flat roofs were more expensive because they required asphalt coverings, which led them to build "boxes with lids" instead of pure boxes).[68] In fact, industrialization could very well lead to other sorts of forms, and in many experiments with prefabrication it leads to forms that are perfectly traditional, if not particularly inspired (as it did, for example, with steel framed houses that were popular in England in the 1910s and in Germany in the 1920s). It is more the joining of the two ideas together—or rather, making it seem like the first one necessarily leads to the second—that explains the box.

[67] Reyner Banham, *Theory and Design in the First Machine Age* (London: Architectural Press, 1983), 80. Banham does not give the original source of the quote.
[68] Swenarton, *Homes Fit for Heroes*, 146.

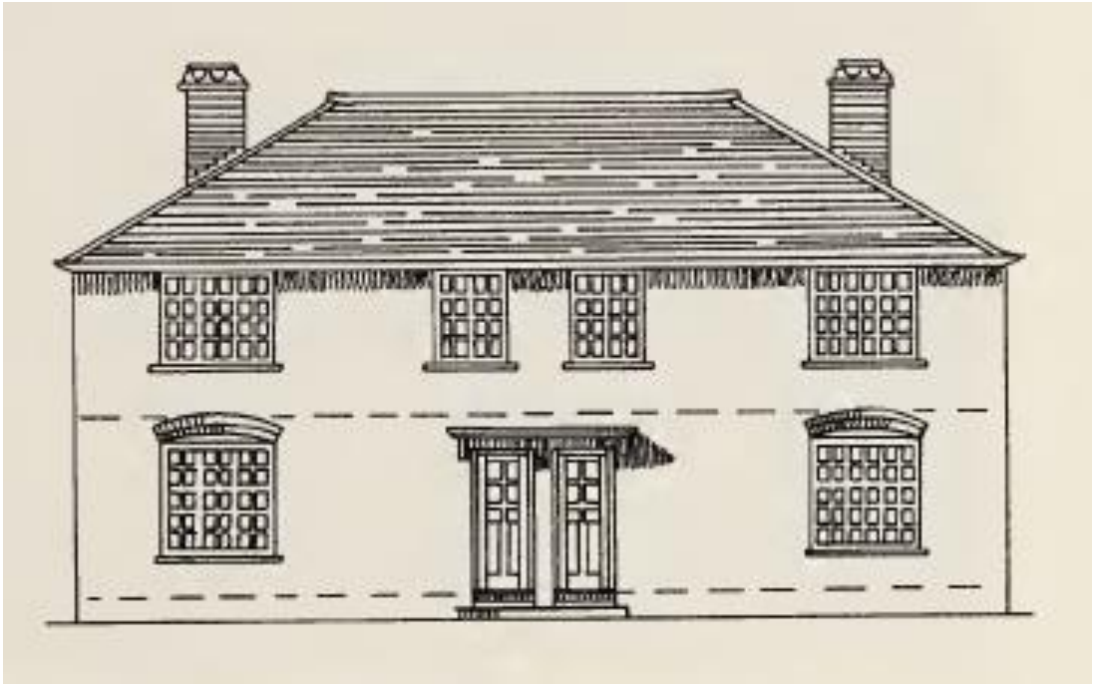


Figure 4 'Box with lid' in a 1919 British design manual (in Swenarton, Homes Fit for Heroes*, 145)*

But whatever the ideas behind the box, you do have people in Germany in the 1910s who are producing actual box-like buildings (the canonical examples are Adolf Loos's Steiner House or Gropius' Fagus Werke) as well as putting up exhibitions about them (as with the 1914 Werkbund Exhibition, which featured more box-like buildings) and writing about why the box made sense. Now, such people may not be around—in sufficient amount at least—in Britain, where the architects tend to be suspicious of the machine, but they are around in other countries outside Germany. You have them, for example, in France and in Holland and in Russia (French builders and architects in particular do a lot to make reinforced concrete more popular than before—Hennebique through perfecting it and Perret through making it more acceptable in architect-designed buildings). There are some in the US as well: people are thinking about buildings and machines in many different places.[69] But the

[69] See Nikolaus Pevsner, *Pioneers of Modern Design: From William Morris to Walter Gropius* (London, England; New York, N.Y., USA: Penguin Books, 1960) for a general overview and Banham, *Theory and Design in the First Machine Age*, on Perret and his contemporary Choisy.

reason that what the people in Germany wrote matters more for our story is that in Germany you have much stronger connections between the architects and artists who think about all things machine-related and people with power in politics and industry—which obviously translates into what those architects and the artists are able to do.

One of the reasons you have those connections is that some of the people with power in Germany think of their country as backward compared to England or France and think that, if German industrial products are to compete, they need to be a lot better than they are. And for them, the way of getting there is through bringing in artists. Not, to be sure, artists in the Romantic-bohemian understanding, but artists that would serve the motherland in a rather disciplined way. One example of a place where these connections happen is an organization called the German Werkbund, which Hermann Muthesius, a Prussian civil servant, sets up with several others in 1907 (saying, at some point early on, that "[the] development of taste, the enjoyment of the handling of Form, hold a decisive meaning for the future status of Germany in the world.")[70] The Werkbund, until it was taken over by the Nazis after they came to power, did a lot to promote the box, especially after the mid-1920s. Another example is the architect and designer Peter Behrens joining AEG as the chief creative consultant in 1907 also. Behrens designed several major buildings for them before WWI—not pure boxes, to be sure, but box-like in a classicizing way. He also trained in his office several architects who will later design many a box—Gropius, Mies van der Rohe, and Le Corbusier among them. And after the war, there is Bauhaus, which Gropius leads between 1918 and 1928, the goals of which have to do with industry as well (Gropius: "The Bauhaus workshops are essentially laboratories in which prototypes of products suitable for mass

[70] Banham, *Theory and Design in the First Machine Age*, 77.

production and typical of our time are carefully developed and improved")[71]—and it is actually Bauhaus that produces the drawings of some of the first absolute boxes—white cubes with doors and windows—while experimenting with the already-mentioned idea of assembling houses like Lego blocks (if you are going to do that it is obviously easier to work with cubes than with anything else, at least as far as conventional shapes are concerned; a prototype box, Haus am Horn, actually appears in a Bauhaus exhibition in 1923).[72]

Figure 5 Haus am Horn in Weimar, Germany. Designed by Walter Gropius, Georg Muche, and Adolf Meyer. Completed in 1923.

[71] Ulrich Conrads, *Programs and Manifestoes on 20th-Century Architecture*, 1st English language ed. (Cambridge, Mass: MIT Press, 1970), 96.

[72] That said, the prototype is not exactly a success: as its funder wrote to Gropius, "What now remains is a strange (seltsames) house which one can argue about if one likes, but which, when observed as a sales object, poses great difficulties and which costs many times more than what a solidly built, normal house would cost in comparison." Sommerfeld to Gropius, September 17, 1923, Bauhaus-Archiv, Berlin. Quoted in Robin Schuldenfrei, "Capital Dwelling: Industrial Capitalism, Financial Crisis, and the Bauhaus's Haus Am Horn," in *Architecture and Capitalism: 1845 to the Present*, ed. Peggy Deamer (London ; New York: Routledge, Taylor & Francis Group, 2014), 90.

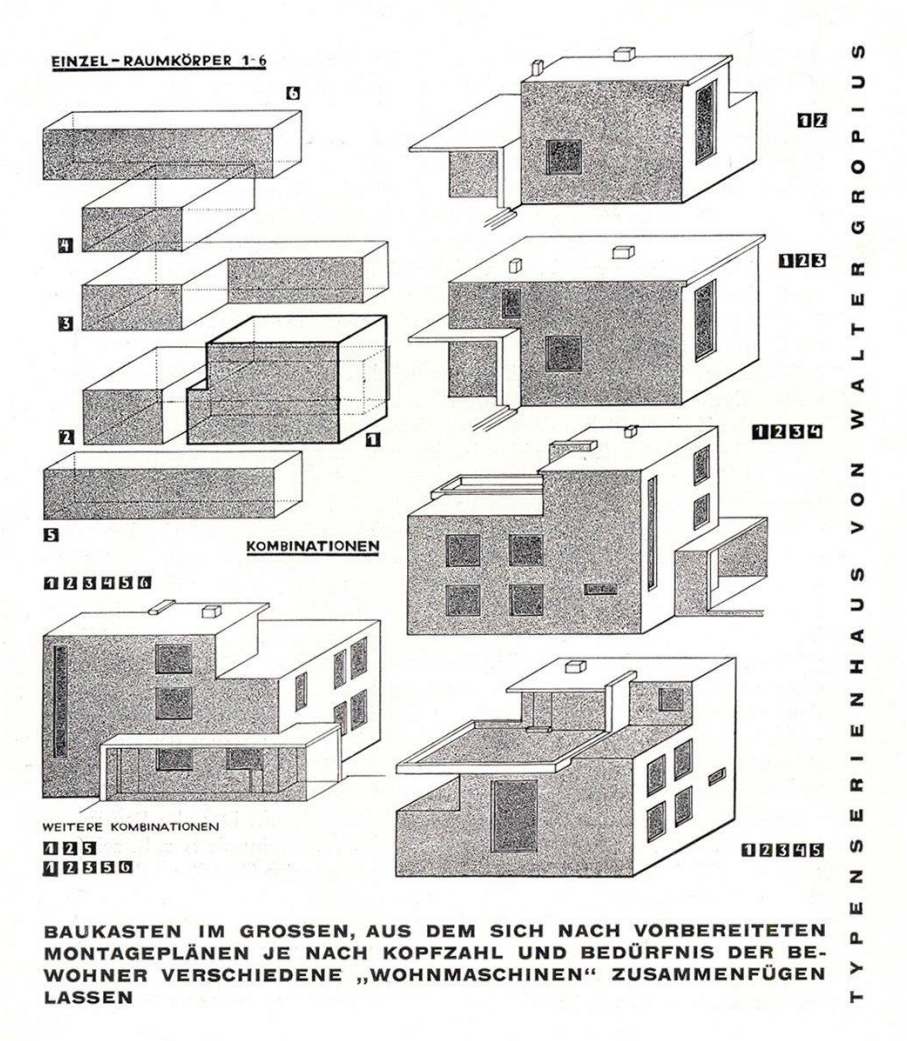


Figure 6 Walter Gropius, Large-scale building blocks, 1922

All of the above is to say: in Germany by the early 1920s you have the kind of intellectual and organizational infrastructure in place that is in favor of the box that you do not have in place elsewhere. This infrastructure is not necessary for answering the question of, "How do we build a lot of housing quickly and cheaply?"—but it *is* necessary for arguing for an answer that looks much more radical than anything that came before and defending it afterwards.

The buildout of the box: Frankfurt and Berlin

Once you have the intellectual infrastructure in place, and once you have the very large scale of the housing program, it becomes likely that at least in some places the architects of the box will be in charge of building. That, in fact, is what happens. It happens in a lot of places—larger towns like Breslau, Hamburg, Düsseldorf, Magdeburg, or Cologne; smaller places like Altona or Duisburg or Celle—but most famously it happens in Berlin and in Frankfurt, where between 1925 and 1930 you get almost 30,000 housing units in various versions of the box.

The way in which it happens is a bit different in the two cities. In Frankfurt you have an activist mayor, Ludwig Landmann, who wants to transform the city.[73] His vision of the transformation includes solving the housing problem, for which purpose he talks to a whole lot of people (including Gropius, who declines) and eventually brings in Ernst May, who before this was mostly building fairly traditional-looking rural housing in Silesia[74] but who had already been experimenting with some forms of pre-fabrication in wood which resulted in boxlike shapes (as in his House for a Middle Class Family exhibited at the Breslau Spring Fair in 1924.[75] May then leads a new office which, first, allows him to accept or reject all applications for federal and municipal housing funding and, second, gives him control over building codes enforcement (*Baupolizei*, which in other cities could block new ways of building). He then takes the power and money that he has and delivers the box quickly and in large amounts: more than 600 new dwellings in less than 12 months[76] and ultimately around 15,000, which was 90 percent of *all* the new housing in Frankfurt between 1925 and

[73] See N. Bullock, "Modern Design and Municipal Patronage: Frankfurt 1924 30," *Oxford Art Journal* 2, no. 2 (April 1, 1979): 21–24, https://doi.org/10.1093/oxartj/2.2.21.
[74] See Susan R. Henderson, "Ernst May and the Campaign to Resettle the Countryside: Rural Housing in Silesia, 1919-1925," *Journal of the Society of Architectural Historians* 61, no. 2 (June 2002): 188–211, https://doi.org/10.2307/991839.
[75] Henderson, 204.
[76] Bullock, "Modern Design and Municipal Patronage," 22.

1933.[77]

Figure 7 Early Frankfurt siedlung*: Bruchfeldstrasse, 1926*

In Berlin you have an administration that is not so excited about experimentation so initially it is one of the municipal building societies that runs with the box. Martin Wagner, a man who really wants to use technology and large-scale construction to solve housing problems and who used to run one of the subsections of municipal building administration in Berlin-Schöneberg,[78] sets up a large new society called Gehag (Gemeinnützige Heimstätten-Aktiengesellschaft, which was actually a merger of several preexisting societies with some new capital added, mainly from the Socialist trade unions and building trades) and has the architect Bruno Taut appointed director. Gehag under the two of them builds a lot: more than 70 percent of the 14,000 new box-units that appeared in Berlin between 1924 and 1933 (Wagner tried to build outside of Gehag, too: he became the director Berlin's Central

[77] Lane, *Architecture and Politics in Germany, 1918-1945*, 102.
[78] Lane, 104.

Building Administration in 1927 and tried to act on the same scale that May did in Frankfurt—but Berlin was a bigger city and Wagner didn't have as much power as May did, so he only built a few public buildings).

The building of housing—boxes or not—starts to slow down after 1929, and a lot. The big reason is of course the Great Depression: there just isn't as much money around to spend on housing, and there is also a new government that includes those who simply do not want it. What happens specifically is that the government starts taking away the money from the rental tax: first, in 1929, they redirect some of it to the more rural areas and allow the use of it for non-housing purposes; then, in 1930, they allocate half of the total sum of it to non-housing; then, in 1931 they add to the non-housing allocation a third of the remaining half (so another sixth); so finally, by the end of 1931 you end up with only 20 percent of the revenues to be used for housing: a fivefold fall in two years.[79] May and Taut both leave for the Soviet Union already in 1930, hoping to build new cities there (though that does not go very well); Wagner and Taut hold out till 1933. But whether in 1930 or in 1933, the first era of the triumph of the box ends.

The people who promote the box do accomplish some of what they said they would accomplish, which is, build quickly and cheaply. It is not clear that what they accomplished had as much to do with machines and industry as they initially said it might. As in, there certainly were experiments and improvements: May especially was trying new methods of building—including, for example, pouring some of the elements of his later buildings in one place at the construction site and then installing them with cranes once they were cured—but these were experiments. When the time came to reduce costs in 1929, May did not turn to technology: instead, he shrank the average apartment to 38 square meters and made the

[79] Susan R. Henderson, *Building Culture* (Peter Lang US, 2013), 439, https://doi.org/10.3726/978-1-4539-0533-3.

layout of streets much simpler than before, which produced the so-called Zeilenbau, which became an example—for being cheap—for much of what came after.[80] So the actual dream of making houses like machines still remained mostly a dream—and certainly the actual boxy look of the houses did not make them any cheaper to build than in 1918—at least with the kind of big reductions (20, 30, 40 percent) that would not disappear in the variations of methods and costs from one building site to another. The boxy shape—as opposed to manipulations with size, room plan, and street layout—remained mostly an aesthetic choice. Or perhaps an article of faith: one that said that, with time, such a shape—or rather, the mechanization of which it would be the result—will lead to reductions in cost.[81]

But no matter: the box had been built, and on quite a large scale, too. And what was even more important was not just that it was built but that—because of how much the press wrote about it—it became something that an educated person could have an opinion about.

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[80] Henderson, 399. May himself was none too excited about it and considered those measures temporary, writing, "Faced with the question of whether to leave hundreds of thousands of people for years to come in their misery or whether, as soon as possible, even a small flat should be made available to them, the political realist will decide in favor of the second solution, if he is able simultaneously to take the necessary organizational measures to combine pairs of these flats into normal-sized flats upon the return of economically better times." (Ernst May, "Flatlets," Linoleum, 165–66, quoted in Henderson, 426; it is not clear that the reference is correct). That, of course, did not come to pass.

[81] Gropius in 1926: "The economic issue towers in the foreground. Attempts to economize traditional handicraft methods of residential construction through more rational operating procedures have brought only slight improvement. The problem was not attacked at the roots. The new goal is dry-assembly construction, that is, the mass prefabrication of residential buildings to be constructed not at the building site but for the most part in assembly-ready units by special factories. That would mean something like a full-sized set of building blocks that would make it possible to order a house from the factory inventory as one orders a pair of shoes. Experts estimate the savings to be expected from constructing houses in this way at 50 percent or more compared to traditional methods. The reduction in the cost of our daily-consumption items resulted from an increase in the use of mechanical forces—steam and electricity—in comparison to individual manufacture by hand; the reduction in the cost of housing construction likewise depends on the exploitation of mechanical forces." Walter Gropius, "Who Is Right? Traditional Architecture or Building in New Forms." First Published as "Wer Hat Recht? Traditionelle Baukunst Oder Bauen in Neuen Formen," Uhu, No. 7 (April 1926), 30-40. In *The Weimar Republic Sourcebook*, ed. Edward Dimendberg, Martin Jay, and Anton Kaes (Berkeley, CA: University of California Press, 1995), 441.

Figure 8 Cost reduction through simplified street plans: Ernst May's Westhausen Siedlung (1929)

The box and the public

The reason that what appeared in the press is important—and maybe even more important than the actual buildings, which, after all, were not *that* many—is because in every society you need to go through a certain process if you want to change how you do something about which people with at least some power tend to have an opinion (so in the case of buildings, that would be not just factories or housing for the poor on city outskirts but the sorts of buildings that one thinks of as important—for example those that stand where those with power will see them or those, of course, that those with power pay for with their own money). The sort of process that it is depends on the particular society: in a society with a lot of concentration of power it may be enough that the person at the top says it should be so (after which a few newspapers will write about why it is important and the deal will be done within weeks); in a society with less concentration of power the process takes longer and

involves more work: more newspaper articles for and against; more exhibitions; more arguments; more controversies; more books published.

Weimar Germany was of course a society with less concentration of power than the German societies that came either before or after it—so the process was of the longer sort. Strictly speaking, that process was not necessary for the purposes of building mass housing: someone like May could very well build without it given the kind of support he had from Mayor Landmann and also given how much the people who moved into the new housing tended to like it (which was not surprising considering that many of them were basically homeless before that). But the box architects had bigger ambitions than just building public housing: most of them wanted everything to be ultimately built that way—and so they used the fact that they were building housing in the shape of boxes as a way of talking about bigger and better questions. So not just, "How do we build public housing?"—but overall: "How do we build?" Which, by the way, was not a question that they could have raised in the popular press if they had not actually been building something (you can of course argue about how to build while building very little or nothing at all but then you do it in specialized magazines, as some of the architects thinking in box-like directions had in fact been doing for a hundred years before the 1920s). All of which is to say that the fact that the architects of the box got to build on a reasonable enough scale and the fact that this scale—at least in a couple of important cities—began to approach something like public importance (especially in Frankfurt, where, as we already said, 90 percent of new units were built in the way of the box) allowed them to get the kind of public attention to the new way of building that would have been far harder to get if they were just building factories or villas for the rich (which of course some of them had been doing as well both before the housing programs and in parallel to them).

Now, creating attention requires work—and that work the promoters of the box did put in.

First, there were the master builders themselves: May in Frankfurt and Wagner in Berlin. They published well-produced magazines—*das neue Frankfurt* and *das neue Berlin*, respectively—of the sort that an educated layperson could have on their coffee table if they wanted to think of themselves (and have others think of them) as interested in all things progressive. And second, there were the organizations that were supporting the box: mainly the two—the Bauhaus and the Werkbund—that helped the box come to prominence in the first place (there was CIAM as well, set up by Le Corbusier, but CIAM only started working in 1928—with its first meeting in Frankfurt, incidentally—and became important in the 1930s and after).

Of the two box-supporting organizations, the work of the Werkbund—which, after the mid-1920s became much more pro-box than the more inclusive organization it had been till then—had to do directly with architecture more directly. Most importantly, in 1927 the organization put on the Weissenhofsiedlung exhibition in Stuttgart—a demonstration of what the future of building could look like. It was housing, but housing of mostly a fancy sort: the sort that would never be built for mass housing programs and the sort that made an observer write, "we are finally at the point of producing houses and apartments for our time in which the people of today can feel good."[82] The exhibition was criticized, of course—for example, for giving too little thought to how houses would actually be used (one had to cook turning away from the light; the windows were big enough and low enough that a child could fall out easily; the rooms got seriously hot because there were no blinds)—but again,

[82] "The Stuttgart Werkbund Houses." First Published as 'Die Stuttgarter Werkbundhauser,' in *Mit Anderen Augen. Fahrbuch Der Deutschen Sonntagszeitung*, Ed. Erich Schairer (Stuttgart: Verlag Der Sonntagszeitung, 1929), 236-238." In *The Weimar Republic Sourcebook* (Berkeley, CA: University of California Press, 1995), 470.

the point was that the box and its houses became something about which one argued in the press.[83] It helped, too, that half a million visitors came to see the exhibition itself.

Bauhaus, like Werkbund, did some work on architecture as well (as with its Haus am Horn or its own much-photographed buildings in its new home in Dessau)—but what was arguably more important was the story of its move from Weimar. The actual story is long and somewhat convoluted because it took several years to play out,[84] but the gist is that Bauhaus, when founded, absorbed the art school in Weimar that had been around for a long time and that some prominent people were quite attached to. These people quickly became unhappy once Gropius—who ran the Bauhaus—showed in different ways that he did not much care for what the school had been doing before (things like landscape painting, for which it was famous). These people began to attack Bauhaus in the press and started asking for the art school to become separate again. The school did eventually get its own funding back, but the attacks, once they started, continued (some more sophisticated—born out of actual disagreement with the sorts of works that the school encouraged—and some less so, with accusations of "too many foreigners" around). Eventually the politics changed enough that Gropius was forced out and, late in 1924, took most of the staff and the school's name with him to a new home in Dessau. The school was fine in the new place—Dessau was much friendlier to it than Weimar had been—but the important thing was that the Bauhaus controversy was fairly extensively covered in the national press, with prominent people writing letters in its support, which meant that even before mass housebuilding started (and before *das neue Frankfurt*, and *das neue Berlin* started with it) the Bauhaus issue—and by

[83] Marie-Elisabeth Luders, "'A Construction, Not a Dwelling.' First Published as 'Baukorper Ohne Wohnung,' *Die Form* (October 1927), 316." In *The Weimar Republic Sourcebook*, ed. Edward Dimendberg, Martin Jay, and Anton Kaes (Berkeley, CA: University of California Press, 1995), 468–69.
[84] See Lane, *Architecture and Politics in Germany, 1918-1945*, 68–86.

extension, the whole issue of new ways of building and making art—was becoming prominent.

Between the Frankfurt and Berlin magazines and the Bauhaus and the Werkbund you already had decent amounts of box-related coverage (and of course the papers were writing about the new buildings as a matter of course just because they were actually happening). But what was also important was not just the arguments of those who supported the box but also of those who were against. Of course, you always have the arguments against appearing in the press: you *need* to have those sorts of arguments in the process of making something accepted (even if there are a thousand opinions for and one against the newspapers will publish the one against to appear balanced). But what was important here is that through some curious turns of history (though which turns aren't?) the arguments of those who were against the box got the support of some of the wings of the Nazi Party. Not enough support, to be sure, that the architects of the box would be sent to the concentration camps (unless they were Jewish), but enough that their first rank—men like Mies or Gropius—stopped getting commissions, lost their positions of importance, and decided to leave Germany.

The story, as with the story of Bauhaus's move from Weimar, is plenty complicated,[85] but the gist is that in the mid-1920s there was opposition coming to the box from the side of several architects who did not think it was the right way to build (a famous 1926 polemic between Gropius and the most prominent of these men, Paul Schultze-Naumburg, had the very Manichaean title of "Who is Right? Traditional Architecture or Building in New Forms"). Some arguments were perfectly reasonable—the complaint was of being too subservient to industry and machines[86]—but some were race-flavored from fairly early on

[85] See Lane, 169–84.
[86] Some of the roots of this went to the early-20th century Heimatschutz movement, which tried to find a balance between developing industry and protecting Germany's natural beauty; see Christian F. Otto, "Modern

(Schultze-Naumburg, in the polemic: "[W]hat kind of theater is being indulged when one recommends to Germans dwellings whose models are clearly seen in East Asian, Indian, or even Negro art?"),[87] and became more so as time passed.

The racial rhetoric by itself would not necessarily have been enough to have the Nazis protest the box—after all, most boxes were housing for workers, even if the Socialists sponsored them. What helped was that, on the one hand, the Nazi party had influential officials—chief among them Richard Darré and Alfred Rosenberg—who liked Schultze-Naumburg's ideas and that, on the other hand, the Nazi press (and specifically the *Völkischer Beobachter*) got more involved with discussions of architecture, at first in a general kind of way because, after around 1928, it tried to appeal more to the educated and then in a more anti-box way because the first Nazi to become a state minister—Wilhelm Frick in Thuringia, who became the minister of education—appointed Schultze-Naumburg to run what was left of the Bauhaus in Weimar; and when both had to go because the Nazis were too much even for the right-wing coalition partners, the VB picked up Schultze-Naumburg's cause. All of this together meant that by 1933 the Nazis had invested enough, rhetorically, in fighting the box that they had to do at least something about the people who supported it. That they did: Taut and May could not return to Germany from the USSR (easy enough to justify because both were self-proclaimed Communists), Mies was told to fire from the Bauhaus (which he by then ran) several teachers that the Nazis did not like (whereupon he and his colleagues disbanded the school), and Gropius was finding it difficult to get work. The attack did not go further than that: the second tier architects could keep their jobs, and the Nazis did not go after Mies and Gropius further, which was

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Environment and Historical Continuity: The Heimatschutz Discourse in Germany," *Art Journal* 43, no. 2 (June 1983): 148–57, https://doi.org/10.1080/00043249.1983.10792216.

[87] Paul Schultze-Naumburg, "Who Is Right? Traditional Architecture or Building in New Forms." First Published as "Wer Hat Recht? Traditionelle Baukunst Oder Bauen in Neuen Formen," Uhu, No. 7 (April 1926), 30-40. In *The Weimar Republic Sourcebook*, ed. Edward Dimendberg, Martin Jay, and Anton Kaes (Berkeley, CA: University of California Press, 1995), 445.

probably because Goebbels, who had the greatest power in all matters culture-related, was more interested in cultural control than in getting involved in architectural debates—but it was enough to get both Mies and Gropius (and many others) to leave Germany as well as attach to the box the label—helpful after the end of WWII—of something that the Nazis did not like, even though it was true only of one wing of the party, and the less influential one at that.[88]

So much for the box in the 1920s and early 1930s: it got built on a large scale, it became something that educated men could have an opinion about, and the Nazis hampered it enough that it could claim anti-Nazi credentials later. The box does continue, after 1934, to get built: a few buildings by people like Terragni in the North of Italy, where the Italian Fascists thought they were acceptable for the local taste (not the case for Rome, for instance), a few buildings by Le Corbusier in France, and even a few box-like buildings in Germany (for instance, the Hermann Göring Works outside Linz).[89] But nothing came close to the scale of May and Wagner. It is only after the war that the question of the box returns

[88] Gropius and Mies tried to appeal to Goebbels for support early on, too. Mies entered the competition for the new Reichsbank in 1934 (which he lost to a more classical entry) and Gropius wrote to Hönig, head of the Reichskammer der bildende Künste (the architecture division of Goebbels's Reichskulturkammer), echoing the "In What Style Should We Build" debate: "Shall this strong new architectural movement which began in Germany be lost to Germany? Must we be forced to stop our work, when the entire world has begun to accept our initiative and to carry further our inspiration? . . . Can Germany afford to throw overboard the new architecture and its spiritual leaders, when there is nothing to replace them? . . . The new architecture offers vast opportunities for creative development. But above all I myself see this new style as the way in which we in our country can finally achieve a valid union of the two great spiritual heritages of the classical and the Gothic traditions. Schinkel sought this union, but in vain. Shall Germany deny itself this great opportunity?" Gropius to Hönig, March 27, 1934. In file "Eigener Kampf mit Nazis," Gropius Archive; quoted in Lane, 181.

[89] Albert Speer claimed that Hitler, after visiting the works in 1943, appreciated the box where he thought it belonged—though Speer is not necessarily a reliable source, especially given his own aesthetic preferences. At any rate, Speer: "When we left the big steel plant, Hitler expressed his appreciation of the modern steel and glass architecture. 'Do you see this facade more than three hundred meters long? How fine the proportions are. What you have here are different requirements from those governing a Party forum. There our Doric style is the expression of the New Order; here, the technical solution is the appropriate thing. But if one of these so-called modem architects comes along and wants to build housing projects or town halls in the factory style, then I say: He doesn't understand a thing. That isn't modem, it's tasteless, and violates the eternal laws of architecture besides. Light, air, and efficiency belong to a place of work; in a town hall I require dignity, and in a residence a sense of shelter that arms me for the harshness of life's struggle. Just imagine, Speer, a Christmas tree in front of a wall of glass. Impossible! Here, as elsewhere, we must consider the variety of life." Albert Speer, *Spandau: The Secret Diaries* (Bronx, NY: Ishi Press International, 2010), 170.

in two areas of which we already spoke—industrialized housing in Europe and high-rise office buildings in the US (though, of course, in new ways). To the latter (mostly) we now turn.

The victory: The box as the solution to speculative office development in New York City from the 1950s onwards

As you may recall from chapter one, for New York office buildings, a box built to the edge of the lot is in theory the ideal building type—at least for profit-maximizing developers. After WWII, there is a demand in the city for extra space, too: all the more reason to build that way. It takes some time for that space to appear because until the 1950s two constraints—technology (mainly the lack of good artificial light, but also the lack of air conditioning) and New York City's zoning laws—lead to other forms. In the 1950s though, the technological constraints go away, a few buildings appear that show that it is possible to build pure boxes, and zoning laws follow—so from the 1960s on, the box comes into its own. Let us now see how that happens.

The need for space and the constraints on providing it

In New York in the late 1940s and in the 1950s there is a need for office space. The city is going through an office boom of sorts, cautiously at first (1947-1949) and more and more quickly from 1950 onwards, once the developers realize that the demand is here to stay. The demand comes up for several reasons. First, more corporations move into to the city. There are different theories about why they do that: maybe it is because the managers want to be close to others like them (the sociologist Daniel Bell thought in the 1960s that it was partly because the age of the family firm was over: "When the 'deracinated' manager 'makes it' in the impersonal world of corporate capitalism, he wants other people to know about it, these

other people being the tribe of corporate managers; hence the lure of New York")[90] or maybe because those managers just wanted to be where the people are (the CEO of Lever Brothers—which would build Lever House, which we will get to in a little while—said, "Lever's selling philosophy thrives on congestion… Congestion is people… Where the most people are is where we should be.")[91] But whatever the reason, they do move—in 1956, 29 out of 70 national corporations with assets of $1bn or more have their headquarters in NYC[92]—and they hire more people, too. As a result, there are 18 percent more white-collar workers in the city in 1960 than there had been in 1947.[93]

The companies also want more space per person, which is because there are more managers, more office machines, more libraries and cafeterias—and also because some companies make their spaces less crowded because they can. That pushes demand further yet: just a 10 percent rise in space per person would supposedly require 15 million square feet more space, which was a third of what was built in those years (but it was said that the rise in space per person was as much as 25 percent).[94] Finally, even those who already had space are replacing it with newer buildings—better-lit and better air-conditioned—and creating a lot of new space in the process (in 1947-1960, owners tear down five million gross square feet and build 40 on the same sites).[95] All of this together and the fact that not much was built during the war meant that—unlike the 1930s and the war years (Empire State stood three quarters empty between 1931 and America's entry into WWII and did not start to

[90] Daniel Bell, "The Three Faces of New York," Dissent 8 (summer 1961): 222-32. Quoted in Robert A. M. Stern, David Fishman, and Thomas Mellins, *New York 1960: Architecture and Urbanism Between the Second World War and the Bicentennial*, 2nd edition (New York, NY: The Monacelli Press, 1997), 61.
[91] Charles Luckman quoted in Wesley W. Stout, "Why New York?" *Saturday Evening Post 222* (February 11, 1950): 27, 106-8. Quoted in Stern, Fishman, and Mellins, 61.
[92] Stern, Fishman, and Mellins, 63, referring to an unnamed study from the New York City Department of Commerce.
[93] Stern, Fishman, and Mellins, 62.
[94] Stern, Fishman, and Mellins, 62.
[95] Stern, Fishman, and Mellins, 62.

make a profit until 1950)[96] there is demand for as much space as one could build: vacancy rates stood at 0.2% in 1947, and between 1947 and 1960 New York City gets a third as much office space as all of Chicago then had.[97]

The need for all of this space means that one has a reason to build more on a given piece of land. But there are two problems. First, weak artificial light limits how deep office space can go if it is to remain profitable (generally no more than 30 feet from windows to the elevator core)—and the need to let fresh air in by opening windows does not make it any better (although light is the more important issue: without it, it is literally impossible to do the sorts of work that one does in offices; if fresh air alone had been the problem one might have tried to deal with it with the help of fans). Between these two constraints, developers tend to build—especially for larger plots—plans with light courts that give those buildings the shape of the letters I, O, U, or E. And second, 1916 zoning laws require setbacks from lot lines after a certain height (which changes depending on how wide the street is on which a building is, but is between 50 and 100 feet), which produces buildings with ziggurat-like setbacks at the top (in addition to light courts, if there are any).[98]

The changes in technology

Luckily for both clients and developers, the technological constraints are beginning to go away starting from the 1930s. For lights, fluorescents arrive: GE, together with

[96] Carol Willis, "Form Follows Finance:," in *Landscape of Modernity*, ed. David Ward and Olivier Zunz, Essays on New York City, 1900-1940 (Russell Sage Foundation, 1992), 160–88, www.jstor.org/stable/10.7758/9781610445504.12.
[97] Stern, Fishman, and Mellins, *New York 1960*, 62.
[98] Absolute height, to be sure, is not limited: one can build without restrictions on 25 percent of the lot's area as long as one meets the setback requirements, but the kind of large plots on which it would make sense to build these sorts of tall towers (without having elevators take up most of the space) are rare: Empire State Building is one of the few exceptions that goes straight into the sky, and even that building takes up all of its lot for the first several stories.

Westinghouse, first introduces fluorescent lights in 1938.[99,100] They are much, much better than the incandescent lamps that people used before that: by the 1960s, they are four times more efficient and last between eight and 26 times longer, depending on the design.[101] And air conditioning appears even earlier: the technology was developing since the early 20th century,[102] but by the late 1920s it finally becomes small enough and refined enough to be used in offices (the first air-conditioned office building is supposed to be Milam Building in San Antonio, Texas, of 1928, with George Willis as the architect and M. L. Diver as the engineer; the second, the Philadelphia Savings Fund Society Building, of 1932, by George Howe and William Lescaze). The added comfort it brings is nice, as is the extra light from the fluorescents—but the real reason that both get adopted in many more projects and much more quickly than they otherwise would have been (with a pause, though, for Depression and WWII) is that they make deeper floor plates possible. As a 1959 book put it,

> In the past when an office depended upon windows for light and air, it could extend no further back from the windows than light and air would penetrate in sufficient quantities. But with the development of year-round air conditioning and high-intensity fluorescent lighting, space could extend to any depth. Windows no longer had any except psychological function. Space 50, 60 or even 100 feet deep could be used.[103]

To be sure, air conditioning and fluorescent lights do cost more—but not that much more (and fluorescents eventually pay for themselves in energy savings, especially in new

[99] John H. Campbell, "History and Technical Evolution of High Frequency Fluorescent Lighting," *University of California, Berkeley*, December 1977, https://escholarship.org/uc/item/99f8b419.
[100] The ideas behind fluorescent lighting went back to the 1860s, but—at least in one argument—it took quite some time to develop them further partly because GE was the de facto monopolist that produced most of the patents under which other companies then made incandescents, and because the public was happy enough to see slow improvement in incandescents without thinking much of just how inefficient they were (wasting more than 90% of energy as heat), GE was in no rush to develop the technology. See Arthur A. Bright and W. Rupert Maclaurin, "Economic Factors Influencing the Development and Introduction of the Fluorescent Lamp," *Journal of Political Economy* 51, no. 5 (1943): 429–50.
[101] Campbell, "History and Technical Evolution of High Frequency Fluorescent Lighting," 3.
[102] The standard history is Reyner Banham, *The Architecture of the Well-Tempered Environment*, 2nd ed (Chicago: University of Chicago Press, 1984).
[103] Shultz and Simmons, *Offices in the Sky*, 248.

buildings where one does not have to redo the wiring and the light fittings). So George R. Bailey, a Chicago real estate man, writes in 1949:

> Full-floor development can be produced, complete with air-conditioning, fluorescent lighting and acoustic ceilings, for only about 8 percent more than a standard floor (i.e., with notchback) without air-conditioning and with only ordinary lighting.[104]

And the returns, overall, are nothing to complain about: a year later, in 1950, Lee Thompson Smith, President of the Real Estate Board of New York, says about the new buildings that are appearing in the city:

> These buildings are modern. Primarily they are air-conditioned. But one salient characteristic of the new buildings that cannot be adapted to old buildings at any price is their basic planning. They provide large blocks of space on one floor, with great glass areas, better lighting, fewer courts, less waste space and new automatic elevator arrangements with fewer cars and faster service. Deeper floor areas, among the other developments in design, result in as much as 80 per cent of the space on each floor being rentable space, as compared with 65 per cent in the buildings that were conventional 20 years ago.[105]

The limits of the law and the few pure boxes

65 to 80 percent is a big enough jump, in relative terms—but there is still the second problem, which is that although one can build without light courts, one can still not get to the profit-maximizing pure box because the 1916 zoning law requires setbacks that tend to produce ziggurats. Now, as we said above, the law did not require setbacks for *all*

[104] Heating, Piping, and Air-Conditioning, September 1949; 72. Quoted in Banham, *The Architecture of the Well-Tempered Environment*, 182.
[105] Quoted in Shultz and Simmons, *Offices in the Sky*, 247. The original source for the quote is not given, but it appears to be a 1950 real estate industry publication called *Buildings*, by the Stamats Publishing Company, in volume 50, number 1.

buildings—but the only way to build without setbacks at all was to build on only part of one's lot, which meant that one would be giving up space that one could otherwise rent. That did happen: it happened, for example, in the 1930s with a few of the buildings of the architect Raymond Hood. Hood apparently did not like the ziggurat shape and preferred slab-like shapes instead, so for his Daily News Building (1930)—among other buildings he built—he convinced the client to build less space on the lower floors than zoning allowed so that the building could look more dramatic.[106] That said, for something like that to happen there both had to be an architect who really disliked ziggurats and a client who was willing to make less money from his building than he could; there may have been such architects around, but such clients were certainly rare.

Still, some of these ziggurat-disliking architects did find their clients—and in the 1950s they built three buildings in the shape of pure boxes that became examples for what came after them. The buildings were the UN Secretariat, by Wallace Harrison and Le Corbusier (1950), Lever House, by Gordon Bunshaft of Skidmore, Owings, and Merrill (1952), and the Seagram Building, by Ludwig Mies van der Rohe (1958). In all of them, the main building was a box with glass sides: a shape that would have been the most profit-maximizing had it not been for the laws that, ironically, meant that it could only be used by those who did not care about profit above everything else. That—the relative disregard of profit—was the case for the clients in all three cases: the first one was obviously a not for-profit affair, and the other two were prestige headquarters buildings for the two corporations that built them.

[106] Walter H. Kilham Jr. "Tower Floor Plans of New York Skyscrapers Compared," *American Architect* 138 (October 1930): 91-103. Quoted in Willis, *Form Follows Finance*, 102.

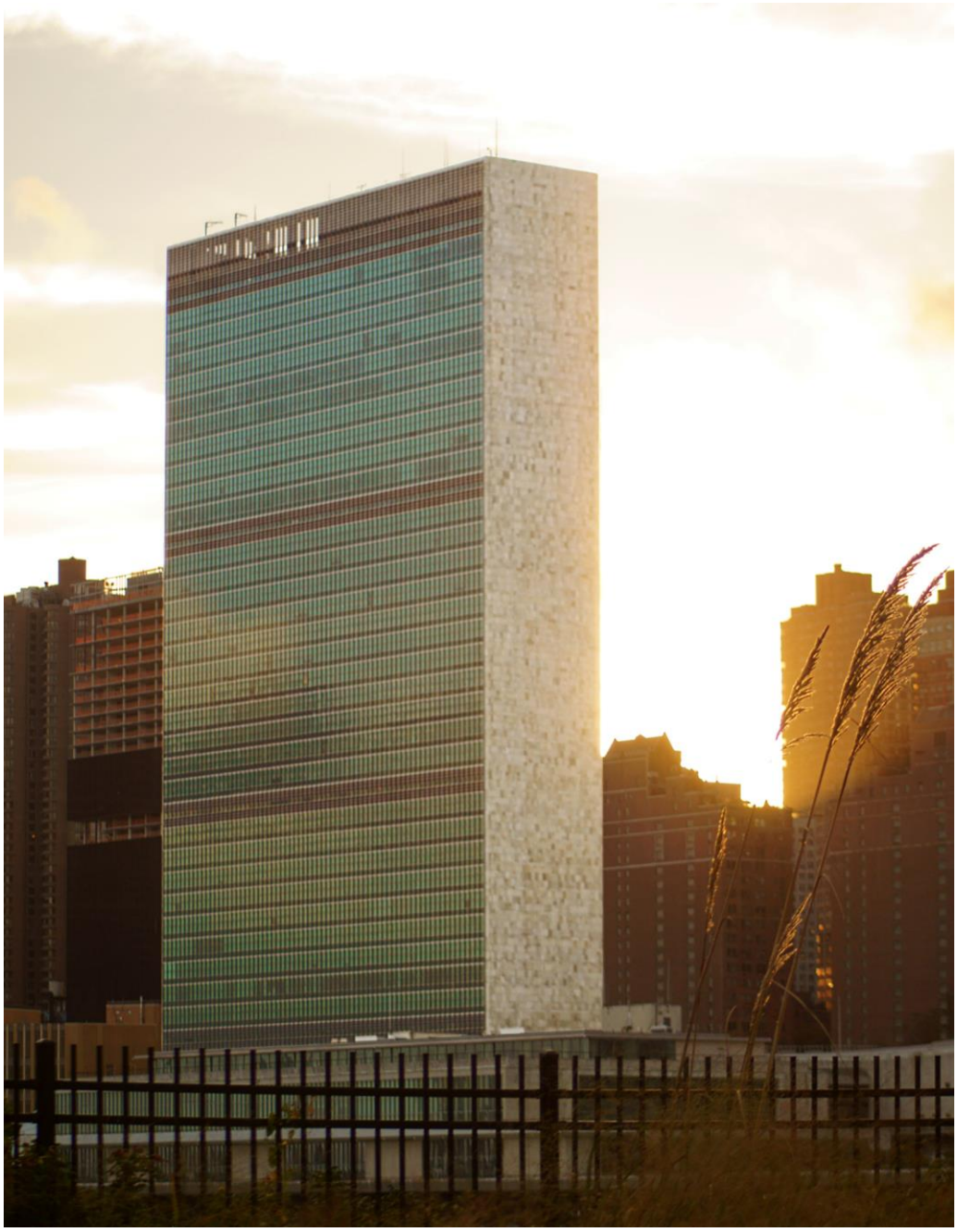

Figure 9 UN Secretariat Building, New York. Developed by the United Nations; designed by Wallace Harrison, Le Corbusier, Oscar Niemeyer, and others. Completed in 1950 (Michael Mommert / 500px)

Figure 10 Lever House, New York. Developed by Lever Brothers; designed by Gordon Bunshaft and Natalie de Blois of Skidmore, Owings, and Merrill. Completed in 1952 (H. Grobe / Wikipedia; image from 1973)

Figure 11 Seagram Building, New York. Developed by Joseph E. Seagram & Sons; designed by Ludwig Mies van der Rohe, Philip Johnson, Kahn & Jacobs, and Severud Associates. Completed in 1958 (Flickr / sourcep)

All three buildings showed a way of building that was somewhat different from what had appeared in the US before then.[107] Not completely different, to be sure: there were buildings before them that were box-like also, like Pietro Belluschi's Equitable Life Assurance Building in Portland (1947) or, before the war, the already-discussed PSFS Building by Howe and Lescaze. But even with these examples and with the three new buildings, pure boxes were still few. If New York's zoning law had stayed the same they may have remained few: examples of corporate fancy or, at best, examples—in the case of Lever and Seagram—of building owners who were hoping to get back in advertising or reputation what they paid in greater construction costs[108] (in the case of the Seagram Building, it was also extra taxes: because of how expensive it was, it was at some point required by the City to pay more in property tax than it would normally be supposed to given how much money it was making from rentals, about which Phyllis Lambert, the daughter of Seagram's owner who had initially convinced her father to go with the expensive experiment, wrote that "what the company paid in real estate taxes it gained in reputation.")[109] But given that technology finally made it possible to build the pure box and that there was demand for a lot office space from which a lot of developers could make a lot of money, it was unlikely that the zoning laws would stay the same for long. And they did, in fact, change in 1961—and when they changed they, among other things, encouraged pure boxes of the sort that UN Secretariat, Lever, and Seagram all were.

[107] All three were also air-conditioned. Banham: "Le Corbusier's vision of the Cartesian glass prism of the slab skyscraper, and [Willis] Carrier's practical technology for solving any environmental problem that offered an honest dollar had met, literally, in the UN building, and the face of the urban world has been altered." See Banham, *The Architecture of the Well-Tempered Environment*, 183.

[108] Woolworth building was an earlier case of this. When the building's contractor, Louis Horowitz, warned his client, Frank Woolworth, that the building was probably too expensive to make a good rental return, Woolworth—according to Horowitz—replied, that "the Woolworth Building was going to be like a giant signboard to advertise around the world his spreading chain of five-and-ten-cent stores." On which basis, Horowitz added, "his splendid building was a sound investment." See Louis J. Horowitz and Boyden Sparkes, The Towers of New York: The Memoirs of a Master Builder (New York: Simon & Schuster, 1937), p. 2. Quoted in Weiss, "Density and Intervention: New York's Planning Traditions," 72.

[109] Phyllis Lambert, *Building Seagram* (New Haven, Conn.: Yale University Press, 2013). Quoted in Dietrich Neumann, "Building Seagram, by Phyllis Lambert," *Journal of the Society of Architectural Historians* 72, no. 4 (2013): 592–95, https://doi.org/10.1525/jsah.2013.72.4.592.

The change in laws to encourage the pure box

Now, the laws did not encourage those sorts of boxes to make it possible to build more: developers had a lot of power in New York, but there was opposition to them, too (though the developers tended to get more of what they wanted than their opponents did). The story was a bit more complex. What happened was that the 1916 zoning law was, as the planner Thomas Adams wrote, "a temporary measure based on a compromise."[110] That law was passed for two reasons: one was that the expensive retailers in the Midtown part of Fifth Avenue did not like their manufacturing neighbors in the Garment District and were hoping to use the law to make sure there were fewer of them; the other was that there were enough really tall new buildings—the Equitable Building of 1916 being the most famous example—that some real estate owners were beginning to lose enough sunlight to start losing rental income as a result. Between these two, the city's real estate industry mostly supported the law's restrictions on building (to be sure, speculative builders were mostly opposed to any restrictions, but they were not in a strong position to argue because 1916 was a time of real estate downturn)—so the law passed and did somewhat limit the size of buildings. That said, already in the 1920s, some people began to feel that the law had not gone far enough and that the future of Manhattan was greater and greater congestion. By the 1930s, there were proposals to tighten the laws further yet. There were radical ones—like one calling for a height limit of six stories if a street was narrow and ten if it was wide—but the kind of proto-consensus opinion that had at least some chance of passing wanted to keep buildings tall—because that's what the real estate industry wanted and because that's what the city's property taxes depended on, too—but shift their volume away from the street and into the

[110] Thomas Adams, "The Character, Bulk, and Surroundings of Buildings," in Regional Survey of New York and Its Environs, Buildings: Their Uses and the Spaces About Them (New York: RSNYE, 1931), p. 119. Quoted in Weiss, "Density and Intervention: New York's Planning Traditions," 47, on which this section is mostly based.

sky, which would create towers that were taller and slimmer and free up space at the street level. In 1961—after delays because of Depression, war, real estate opposition, and New York City politics—these ideas became law.

Now, the law did not explicitly tell developers that they should build pure boxes—but it encouraged them to. There were three ways in which one could build. The first one stayed within the 1916 paradigm, but made it stricter: you could build up from the lot line, but only to 85 feet or six stories (whichever was less), then an initial 20-foot setback (15 on smaller streets), and then a diagonal line at a predefined slope within which the whole building had to stay. The second one made it possible to ignore the initial setback and to get a steeper slope if you set the building back 10/15 feet from the lot line (for wide/narrow streets). And the third one made it possible to build straight up without any setbacks as long as, first, the building was at least as far from the street as one-third of its width (one-fourth for wide streets) and, second, it occupied no more than 40 percent of the lot (up to 50 percent on small lots and 55 on lots bounded by two streets).[111,112] About the third option, the 1958 report by the consulting firm Voorhees Walker Smith & Smith that became the basis for the 1961 law, added:

> "These modifications of the standard requirements for access of light are designed to encourage departures from the widely prevalent "wedding cake" building forms resulting from the rigid envelope imposed by the present resolution. In addition to their

[111] Jerold S. Kayden, *Privately Owned Public Space: The New York City Experience* (New York: John Wiley, 2000), 10–11.
[112] All three options, to be sure, were height-limited, but not in absolute way, but rather through a device called Floor Area Ratio (FAR). FAR limited building floor area in relation to the area of a plot: for example, if one had a 10,000 square feet plot of land and FAR was 15 one could build 150,000 square feet on that plot—but the way in which one built (15 stories of 10,000 square feet or 65 stories of 2,000 square feet) was up to the developer.

other advantages, the proposed regulations offer scope and incentive for original architectural design."[113]

Figure 12 Seagram Building used as an example of a desirable outcome in the 1958 report on New York City zoning

The report did not explain what it meant by "original architectural design," but presumably it meant "something like the Seagram Building or Lever House," because it included photographs of the two on the same page. To what extent Lever and Seagram were *causes* of this change rather than illustrations of something that had been talked about since the

[113] Voorhees Walker Smith & Smith, *Zoning New York City; a Proposal for a Zoning Resolution for the City of New York,* (New York, 1958), 128, http://archive.org/details/zoningnewyorkcit00voor.

1930s is not clear—but it did not hurt that these were high-quality buildings that well-known architects had designed and that the press wrote about a lot.[114] It did not hurt either that—thanks partly to the city's Museum of Modern Art since the 1930s—the box-like forms of what the museum's 1932 show called "The International Style" were already well known to at least the city's elites (some of the most prominent members of which sat on the museum's board). The prestige that at least one of the architects had from his Bauhaus years—Mies van der Rohe—helped, too (Mies even had a personal retrospective at MoMA in 1947). The report also—though without going into too much detail—seemed to say that the pure box made more money for developers than the alternative, or at least it described the 1916 law as "producing rigid and complex building shapes which are not only uneconomic to construct but inefficient to use"—it is not clear what the inefficiency of use meant, but the uneconomic part is clear enough.[115]

The third option was one that most developers would eventually take: a study of 95 commercial office buildings built between 1966 and 1975 that were on large enough plots to provide plazas found that 70 percent of them did so.[116] The economic benefits of building the box might have been reason enough, but there was also another reason: and that was a bonus that allowed a developer to build an extra ten square feet (up from three feet that the 1958 report proposed) of building space for every square foot of space he left open at the ground level under the third scheme as long as that space was a public plaza, defined as an "open area accessible to the public at all times." There were not many requirements attached to the plaza beyond that—no design reviews, for instance—and a lot of money to be made

[114] That was true of Seagram especially: it was done with expensive materials like bronze—for its outside—and cost 30-40 percent more than a building like this would normally cost. See Dietrich Neumann, "Building Seagram, by Phyllis Lambert."
[115] Voorhees Walker Smith & Smith, *Zoning New York City; a Proposal for a Zoning Resolution for the City of New York*, 128.
[116] Jerold S. Kayden, Incentive Zoning in New York City: A Cost Benefit Analysis (Cambridge, MA: Lincoln Institute of Land Policy, 1978). Quoted in Kayden, *Privately Owned Public Space*, 12.

(one study estimated that for every dollar the developers spent on making plazas they made $48 on the extra space they got inside their buildings).[117] As a result of this, post-1961, many a box and many a plaza (often of questionable quality) rose up in New York. The box was now something that would be built not just by prestige-minded clients who wanted to hire expensive architects, but by regular developers who wanted their buildings to make as much money as they could—and the reason it was possible was because those who wrote the new zoning law combined, in unclear proportions, the desire to "insure that public streets and all portions of buildings fronting on streets have access to light and air, and to provide a general feeling of openness at street level,"[118] the desire to make more "economic" buildings possible, and a fondness of the "original architectural design" of the Seagram and Lever kind.[119]

So much for why the pure box appeared in New York in the 1950s and became extremely popular in the 1960s. But one more thing is left to explain, and that is: why did so many of the new boxes use curtain walls, which is to say, the sorts of walls that do not carry any load and are literally hung on a building's structure the way a curtain would be? And, also, why were so many of those curtain walls made of glass? The answer, unsurprisingly, is, "because you could make more money that way."

[117] Jerold S. Kayden, Incentive Zoning in New York City: A Cost Benefit Analysis (Cambridge, MA: Lincoln Institute of Land Policy, 1978). Quoted in Kayden, 12.
[118] Voorhees Walker Smith & Smith, *Zoning New York City; a Proposal for a Zoning Resolution for the City of New York*, 128.
[119] If there are sources that tell more about why the new law was the way it was, I did not find them online. Perhaps there are such sources in libraries and archives, or perhaps the more important decisions about the law were made in meetings of which no notes were kept, which is often the case of such meetings and such decisions.

The adventures of the curtain wall

To be sure, curtain walls in prestige projects like Lever or Seagram were expensive custom-made affairs (in Seagram especially, where they were made of bronze). The reason someone like Mies would use them was because that was the way in which he designed his buildings, whatever his motives were. Mies, unlike Le Corbusier, did not talk much about what he did and why (although it is not clear that it would have helped if he did: what one says about what one does does not always explain why one actually does it), but one can assume that those motives were a combination of three things: a desire to get one's buildings built; a way of building that one was committed to; and a sense that the second would make the first possible at least sometimes. The same held for Bunshaft (who may have gotten inspired by Mies's earlier work; Mies was proposing glass-sheathed skyscrapers for Berlin as far back as 1922, when nobody really knew yet how to even build one), and obviously for Harrison and Le Corbusier as well. But of course, what prestige projects do for their prestige reasons other projects can do for reasons of money—and that is what happened with the curtain wall.

Compared to a masonry wall, a curtain wall in a building has to do with money in three ways. First, it makes buildings more profitable: it makes the walls thinner, and in so doing, it makes it possible to get more rentable space out of the same plot of land, which might sound minor, but can matter a lot to someone who builds in a very expensive market like New York. Second, it makes buildings cheaper to build: because the wall itself is cheaper; because the structure of a building can be less robust (given a curtain wall's lower weight); and because it is faster to build, which saves on the costs of both labor and capital and makes it possible to start renting a building earlier. And third, it may be cheaper to operate, at least in theory: compared to a mediocre masonry wall (the quality of which depends a lot on how qualified the masons are), a curtain wall may be more insulating.

Engineers and architects started to think about these sorts of walls already in the late 1920s.[120] The reason for that was that the walls in the skyscrapers that had been going up ever since steel frames came around were already non-load bearing: they stood on floor plates, and their only role was to separate the inside of the building from its outside. They also took up a lot of space—the standard thickness was 12 inches—which was obviously space that one could not rent. One could try to build them thinner, but then one might start to get issues with water getting in—so already in 1929-1931 there are articles in the Architectural Record and in the Engineering News-Record[121] that argue for a curtain wall's benefits and mention a house in Chicago that used for its walls metal-faced panels with three inches of Rockwool insulation inside and half-inch of plaster on the back (the architects were Bowman Brothers, who were later part of MoMA's exhibition of modern architecture). Then the Depression comes and office building in the US basically stops; then WWII follows—and only after WWII the issue comes back again. In 1946, there is another article in the Architectural Record—by one of the authors, Robert L. Davison, who wrote about it back in 1929-1931 and who was an early advocate of the idea—that argues that curtain walls in multifamily housing could help with the country's post-war housing crisis:

> There is need for every new material and money-saving method that technical ingenuity can concoct. If a new wall system would help in rental housing, the veterans would be especially thankful.[122]

[120] The account that follows largely builds on David Yeomans, "The Pre-History of the Curtain Wall," *Construction History* 14 (1998): 59–82. That includes the selection of the primary sources, although the quotes taken from them focus more on the issue of cost than Yeomans's article does.
[121] Yeomans mentions H. R. Dowswell, 'Walls, Floors, and Partitions in the Tall Building', Engineering News Record, 106 (1931), 319-22; Robert L Davison, 'New construction methods,' Architectural Record 66 (1929), 362-85; and Robert L. Davison, 'The first all metal apartment house: Lake Front Building, Chicago', Architectural Record, 68 (1930), 3-9.
[122] Robert L. Davison, "The Better Wall Is Coming," *Architectural Record* 100, no. 4 (October 1946): 119, https://www.architecturalrecord.com/ext/resources/archives/backissues/1946-10.pdf.

Of course, the real argument is cost: a new wall "only 2 to 3 in. thick instead of 10 to 12 in. thick. This provides an additional rentable floor area which will give a net profit of $1.00 or $1.50 per lineal foot of wall per floor per year."[123] And if someone is worried about custom and tradition, they need not:

> …in apartment construction economics tend to lift the clay feet of traditionalism. The builder is interested in financial return, not in a cozy retreat from the machine age. To many home owners a metal-clad wall would be acceptable only if made to resemble clap boards. The apartment dweller would be less concerned with conservatism. The builder could accept the money- and space-saving advantages without worrying much about tradition.[124]

By 1950—perhaps because, thanks to large-scale federal mortgage subsidies, most new housing for veterans was in single family homes and not in multifamily dwellings (where the walls were already thin and not made of masonry anyway)—the focus shifts to offices. In a 1950 issue of the Architectural Forum that has the words "The Curtain Wall" on its cover, Davison focuses on offices instead and estimates that with a wall that's four inches thick instead of the standard 12 inch thickness an office building—presumably in Manhattan—could earn an extra $18 per linear foot in rental, save $4 per linear foot in construction costs (for a 20-story building), and maybe even save on the order of 2 cents per square foot of wall (which, it must be noted, is not the same as a linear foot) per heating season, or as much as 50-75 cents over the life of a building (note the scale of the increase in extra profits and cost savings compared to multifamily homes).[125]

[123] Davison, 119.
[124] Davison, 119.
[125] Robert L. Davison, "Curtain Walls," *Architectural Forum* 92, no. 3 (March 1950): 83, https://www.usmodernist.org/AF/AF-1950-03.PDF.

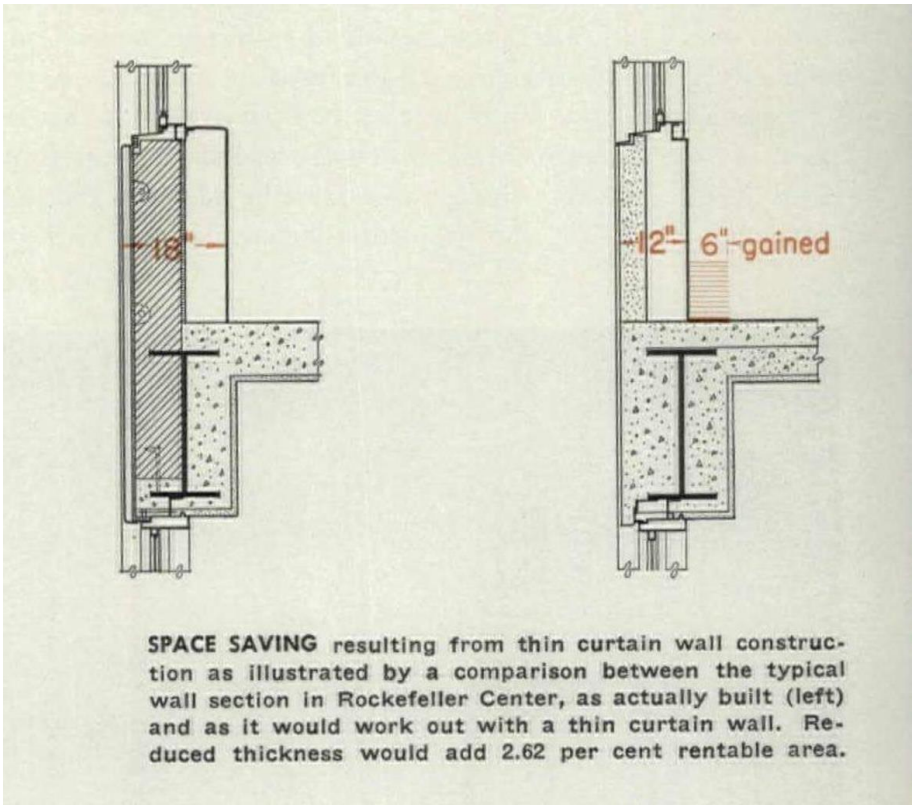

Figure 13 Robert Davison's illustration of space gains from a curtain wall in the March 1950 issue of Architectural Forum

Around the same time, you begin to get actual office buildings with curtain walls made of metal: in 1947, Belluschi's Equitable Life Building used panels of sheet aluminum with 4-inch concrete backing (required by local codes); and in 1952, Alcoa builds its headquarters in Pittsburgh with a curtain wall made of aluminum panels with a back-up wall of pearlite.[126] Glass walls started appearing, too: both the UN building and Lever House used them in 1950 and 1952, respectively (though in slightly different ways: the UN had openable windows, but Lever did not, to keep the air conditioning load down).[127] So the examples were set—but all of these were custom-made and expensive (the Alcoa wall reportedly took several years to design),[128] and if the curtain wall was to actually start

[126] Yeomans, "The Pre-History of the Curtain Wall," 72–73.
[127] Yeomans, 74.
[128] Yeomans, 72.

making somebody more money through building operations instead of (possibly) through greater prestige it had to be standardized.

The standardization could have been in metal, or it could have been in glass. Glass made slightly more sense in money terms, mostly because it was the thinnest option[129] and because it could be developed quickly based on the available window technology. And because nobody appears to have invested enough into a metal system to make it standard, glass (with backing where it was necessary) eventually became more or less standard in office buildings from the 1960s onwards.[130]

In Europe, curtain walls did not spread as much—there were not as many skyscrapers, and therefore not as much pressure to make walls as thin as possible—but they did see early use in the reconstruction of British schools, for instance. A prescient quote is in order: Godfrey Mitchell, a construction engineer who built up the construction firm George Wimpey (now Taylor Wimpey, after its merger in 2007 with Taylor Woodrow, and one of Britain's largest contractors in the years during and immediately after WWII) wrote to a colleague in 1943:

> I think we have got to make up our mind for the next ten years we are going to have no building in this country except Utility Building… owing to the high cost of building and the immense call on the industry, anybody who has got to put up a big shop, block of offices, flats, cinema, or anything of that sort, will have to get down to the barest essentials of a steel-framed building with the minimum of brickwork cladding. This

[129] At least according to Davison's estimations in the 1950 issue of the Architectural Forum, it was the second-cheapest material after stainless steel, which wasn't allowed by codes for not being sufficiently fireproof. It did lead to greater heating expenses, but that was more than offset—at least in the New York market—by the extra rental income. See Davison, "Curtain Walls," 86–87.

[130] Although there were detractors as late as 1958: "The building (the UN Secretariat), costing $65,000,000 which was advanced without interest by the United States government, set a fad that has been widely copied, leading many people to consider masonry wall buildings old-style. Actually the glass walls have no functional purpose, except advertising, and they have some drawbacks. Because of the sun's glare, the glass walls usually are covered with drapes, Venetian blinds or shades. Great expanses of glass increase the cost of heating and air conditioning, and in the winter it often is impossible to have desks close to the cold glass walls. These buildings also require more maintenance." Shultz and Simmons, *Offices in the Sky*, 250.

> austerity building will probably develop a new style of architecture where proportion, balance, suitability for purpose, are the dominant notes…[131]

The style did arrive—even if, in the US, it was for slightly different reasons initially—and glass box was its name.

In conclusion

The office episode is the last one in the story of the birth of the box—or at any rate, the last important one. In Europe after WWII governments of course used the box as a way to build lots of housing—most prominently in the East, where, after 1956, the Soviet government was very clear about the need to build as much as possible as quickly and cheaply as possible—but also in the West, with large programs in, for example, France and the UK. Experiments continued, and so did the dreams of factory-made houses (which sometimes worked and sometimes did not: in France, for instance, it was found, at least in the 1950s, that, because of high transport costs, actual factory production of housing elements only made sense if one built a lot within a very concentrated radius—say, 50 km—which meant that most experimentation and standardization took place in construction sites and not in factories).[132] But that mattered less for what happened after: the housing box as built by large government bureaucracies had a lot less prestige than the box as built by someone like May or Wagner, and at any rate, the prestige of New York office buildings together with the prestige of the German 1920s was enough to make sure that everywhere where a box was either the cheapest or the most profitable solution a box would be built. And so it was.

[131] Memo from Godfrey Mitchell to WHT—11 July 1943. Wimpey Archive, presently held by CIRCA-WICCAD. Quoted in Yeomans, "The Pre-History of the Curtain Wall," 76.
[132] See Nicholas Bullock, "4000 Dwellings from a Paris Factory: Le Procédé Camus and State Sponsorship of Industrialised Housing in the 1950s," *Architectural Research Quarterly* 13, no. 1 (2009): 59–72, https://doi.org/10.1017/S1359135509990108.

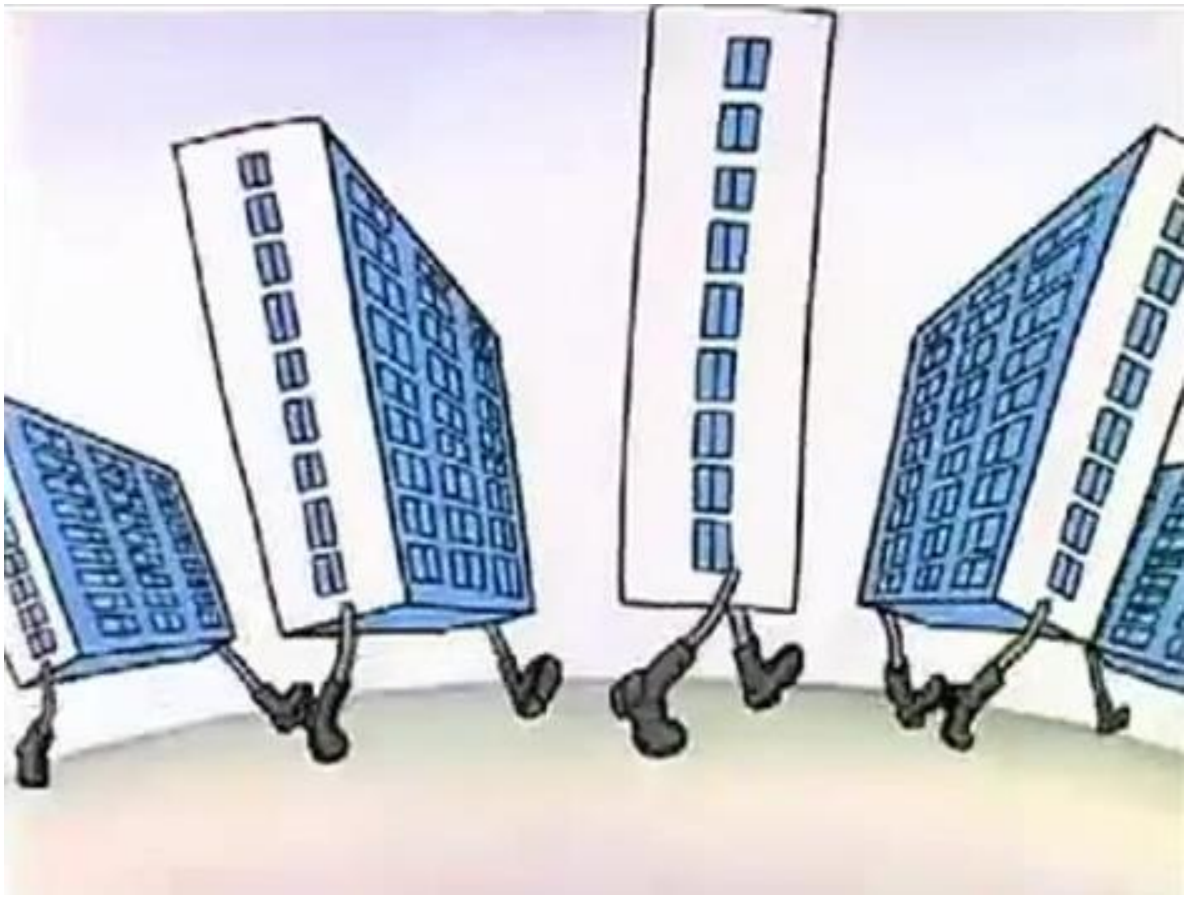

Figure 14 The victorious march of post-war buildings (from the 1976 Soviet film Irony of Fate*)*

An afterthought: Some reasons behind the continuing success of the box and the narratives that contribute to it

The box is what people have been building since the 1960s. The reason is that it works for those who build it: it gives them the most profit, or the most square meters. Prestigious architect-designed buildings have rarely been pure boxes since the 1970s, but most of them are boxes nonetheless: boxes bent in space, boxes with draperies, boxes with giant TV antennas, boxes with ironic pilasters, and so on. The non-prestigious buildings—your average bank headquarters, or your average multifamily apartment block—are boxes pure and simple. The old constraints of climate and material are gone,[133] the sorts of organizations that are paying for buildings—governments and for-profit developers—are everywhere the same, and the result is the same, too.

All this creates not just buildings that look the same, but—as far as buildings yet to be built are concerned—a hegemony of a very real sort: the box is what the clients want and expect; the box is what the architects know how to design; the box is what the builders know how to build; the box is what city regulations expect; the box is what material makers work for; and so on. Sure, there are non-boxes built: architects do it sometimes—people like Jørn Utzon or Le Corbusier (in his last years) or Leon Krier. And non-architects, of course, do it all the time: there is plenty of vernacular building still going on around the world (even if it is getting boxier and boxier as those builders use more and more industry-made materials).

[133] Banham, and it's worth quoting at length: "…by providing almost total control of the atmospheric variables of temperature, humidity and purity, it [air conditioning] has demolished almost all the environmental constraints on design that have survived the other great breakthrough, electric lighting. For anyone who is prepared to foot the consequent bill for power consumed, it is now possible to live in almost any type or form of house one likes to name in any region of the world that takes the fancy. Given this convenient climatic package one may live under low ceilings in the humid tropics, behind thin walls in the arctic and under uninsulated roofs in the desert… the possibility of absolute variety and infinite choice of building form is now with us—and as so often happens with infinite choices, has led to almost perfect homogenisation of what is chosen." Banham, *The Architecture of the Well-Tempered Environment*, 187–90.

But non-architects only build buildings that are small and private—which means that public and commercial buildings, which is what one mostly sees in city centers, are boxes. And the architects that try to build a non-box that is not a major prestige building (like Utzon's Sydney Opera House, ten times over its initial budget) find out that they cannot: Krier, for example, tried to build a school with stone, wood, and bricks and discovered that "this modest school exceeded its budget by 240%. The use of natural materials would have raised the excess to 500%." Therefore: "It then became obvious that however unspecific government briefs may be in terms of aesthetics, construction and materials, school classrooms may not be higher than three meters and walls no thicker than twenty centimeters. The use of natural materials would thus be impossible."[134]

Now, the box does produce the most money in relation to square meters (for developers) or the most square meters in relation to money (for governments)—or that, at any rate, is what it is supposed to be best for. In some ways, that is fine: not every building should be a monument that will last centuries. It is fine for some buildings to be built as quickly and cheaply as possible (think of some factory warehouse); it is also sometimes fine to build as much as possible and as quickly as possible with the money that one has (think of a poor country housing refugees). The curious thing though is that most contemporary societies organize the production of their buildings in such a way that it is not *some* buildings that are built as quickly and cheaply as possible, or with a view to making as many of them as possible—it is that *the vast majority* of them that are that way.

[134] And from all this, a conclusion: "'That which is shabby and false must henceforth be the rule.' From this state of affairs a thinking architect may draw two conclusions. First: 'NOWADAYS I CANNOT BUILD BECAUSE I AM AN ARCHITECT.' Second: 'NOBODY WHO BUILDS NOWADAYS CAN BE CALLED AN ARCHITECT.' If it is true that the phenomena of the ephemeral, of kitsch and of self-destruction are the major products of our industrial civilization, then to be involved in building must be seen as one of the most corrupt forms of collaboration." Leon Krier, *School at Quentin-en-Yvelines*. In K. Michael Hays, ed., *Architecture Theory since 1968*, 1. paperback ed, Columbia Books of Architecture (Cambridge, Mass.: MIT Press, 2000), 357.

That is indeed a curious phenomenon, and about that phenomenon, there are two questions to ask.

First: As a society produces more and more material wealth, at the cost of the time of the lives of those people who work for that wealth and at the cost of extinction of other forms of life on this planet, may there be a point at which that society decides that it has enough material wealth that more of its buildings than before should be something other than the cheapest and fastest kind? That, in other words, the point of creating all that wealth is precisely to be able to have buildings that do cost six times more than the boxy alternative?[135]

And second: Even if one decides that it is fine for the vast majority of buildings to be built as quickly and cheaply as possible, can it be that the way in which it is accomplished—the way of the box—is simply a reflection of the technological ideas of a century ago that no longer hold with the machines of today and that architects, clients, and builders follow simply by inertia? That, in other words, it may be as cheap and as fast to make a non-boxy building now than it is to make a boxy one but our societies have simply not invested enough in actually making that possible?

The first question is political in the proper sense of the word: there is no right answer to it, and the answer one chooses depends on what kind of society one wants to live in. It *is* possible to say that a society *should* continue generating more and more wealth and then using it to build as much cheap space as possible; that, in other words, the point of wealth is to have *as much* of something as possible—square meters, say—instead of having less of

[135] The question also, of course, has to do with the most basic ways in which societies organize their life. If, on one side, one has profit-maximizing developers who owe money that is tied to time to profit-maximizing banks and who compete with other developers and, on the other side, one has consumers who need to do things they mostly do not like in order to be able to borrow money tied to time from profit-maximizing banks so they have somewhere to live, one is very likely to end up with the cheapest, quickest thing being built.

something but of a higher quality. If one says that, there is nothing else to argue about: to be a billionaire who eats ramen noodles is a way of life.

The second question is technical: it can be resolved, and there are people working on some aspects of it—on, say, figuring out how to 3D-print whole buildings. Much may they succeed—though one suspects that if they do their clients will simply print more boxes because that is all that they know how to make.

The biggest issue though with these questions—all the 3D-printing notwithstanding—is that not enough people in most societies systematically ask them. Now, to be sure, general critiques do appear. Here, for example, is Jurgen Habermas:

> …all agree in their critique of a soulless container architecture, of the absence of relationship to the environment and the solitary arrogance of blocklike office buildings; of monstrous department stores and monumental university buildings and conference centers; of the lack of urbanity and the misanthropy of commuter towns; of housing developments, the brutal posterity of bunker architecture, the mass production of A-frame doghouses; of the destruction of city centers for the sake of the automobile, and so forth—so many catchwords, and no dissent to be found anywhere.[136]

The statement of the problem is clear enough—but detailed critiques that go beyond "the box is ugly" are rare, and rarer still are the explanations of why things are the way they are (and it does not help that some book-length critiques—though not particularly detailed—are written by people whose other views alienate large numbers of people, as with Roger Scruton's 1979 *Aesthetics of Architecture*). That maybe is not surprising—what we have

[136] Jurgen Habermas, Modern and Postmodern Architecture. Presented as a lecture at the opening of the exhibition "The Other Tradition: Architecture in Munich from 1800 up to Today," November 1981; published in a new translation in Habermas, The New Conservatism: Cultural Criticism and the Historians' Debate, trans. Shierry Weber Nicholsen (Cambridge: MIT Press, 1989). Quoted in Hays, *Architecture Theory since 1968*, 418.

works well enough for those who make money from it (it is mostly money these days; governments build a lot less than they used to, certainly in housing—but that is a separate story). But it is worth looking in a little more detail at one aspect of how that works, and that is the sorts of stories that one finds about boxes—and buildings generally—in both popular writing and the academia.

The standard story

In popular writing for the educated, the standard story of why most buildings look like boxes is what one may call the heroic one. Here is an example from the architectural critic Martin Filler, who writes for the kinds of publications that the educated read in the United States (the New York Review of Books, for example). This is in the introduction to a book of his called, very appropriately, "The Makers of Modern Architecture":

> If there is one recurrent theme that unites all these essays it is the central role that character and personality play in the creation of architecture, not altogether surprising given that this is the most public of art forms and thus inevitably indicative of the social values of its sponsors. The ways in which designers conceive, rationalize, develop, explain, execute, and promote their works are as varied as the commissions they receive, but their goal is always the same: to persuade others to have faith in their sometimes improbable visions and their ability to bring them to fruition. Even for the greatest master builders, the pursuit of their art is a never-ending series of confrontations and challenges, accommodations and compromises, imposed by the needs (or desires) of clients, financial limitations, legal requirements, and countless other factors that constrain architects to a greater extent than their counterparts in other artistic mediums.[137]

[137] Martin Filler, *Makers of Modern Architecture* (New York: New York Review Books, 2007), introduction.

Filler, to be sure, immediately qualifies: "Added to those impediments, the larger, inexorable forces of politics and economics always have an enormous effect on the profession, whether or not its exponents are politically engaged (although designers who work in the public sphere should always expect that their efforts will have direct social implications and, on occasion, unpleasant repercussions)." But these forces, for him and many other similar critics, are precisely "added to the impediments" (and the way in which the forces are described is also a very particular one: the idea that one can practice a profession that deals with very large amounts of money without being politically engaged—in the broad sense—or without the work having direct social implications is a questionable one). The hero is at the center. And if one focuses mostly on the hero, one is very likely not to focus enough on what made him the hero in the first place—or on what goes on regardless of what the hero is doing.

How this view came to pass is a whole separate story, but there are several pieces to it. First, there is thinking of history as something that great people do, which is something that is as old as history itself: if one can write the stories of battles by looking at the stories of the generals, why not write the stories of buildings by looking at the stories of the architects? Then, there is the general idea of the artist as someone heroic: it starts in the Renaissance (consider Vasari's writings, for instance) and gets stronger with Romanticism, which is when the idea of "improbable visions" first becomes popular. We will not review it in detail,[138] but certainly many an artist—and many an architect—does not mind being seen

[138] Arnold Hauser, at least for writers, tied it to the conditions in which they worked. Hauser was criticized for being too cavalier in his generalizations, but at least he was one of the few who seriously tried to think of art in a social way across a long span of time. At any rate, Hauser: "In the age of the Renaissance famous writers and scholars were certainly extolled, but the average man of letters was put in the same category as the clerk and the private secretary. Now [in the mid-18th century] for the first time the writer as such enjoys the regard due to the representative of a higher sphere of life." And then: "The element of genius in artistic creation is in most cases merely a weapon in the competitive struggle, and the subjective 49 mode of expression often only a form of self-advertisement. The subjectivism of the pre-romantic poets is partly, at any rate, a consequence of the growing number of writers, of their direct dependence on the book market and their competition against one

this way, and it is difficult to fault them for that given how little security they—as a group, as opposed to select individuals—find in a market society. Auguste Perret, for example, told Le Corbusier—who had worked for him at some point—that an architect must be a "prophet with his boards of Law."[139] Le Corbusier—and many others—tried hard to maintain that image, including in what he wrote. Thus in Le Corbusier's introduction to his eight-volume Complete Works one finds the following:

> "I want architects to become the very elite of society—men with the richest (instead of the poorest, narrowest, and most commonplace) intellects and an intelligence open to everything (instead of having an intelligence as hermetically sealed by professional specialism as that of grocers). Architecture is a habit of mind, not a profession."[140]

And:

> "To practise an art is to become your own judge, your own absolute lord and master. You stand before a tabula rasa and what you write upon it is the unalterable product of your own personality."[141]

And:

> "Architecture to me means construction achieved by a triumph of the intellect"[142]

And:

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another, just as the romantic movement in general, with its middle-class emphasis on the sentiments, is nothing more than the product of intellectual rivalry and an instrument in the fight against the classicistic world-view of the aristocracy with its tendency to the normative and the universally valid." Arnold Hauser, *The Social History of Art*, 3rd ed (London ; New York: Routledge, 1999), 47–48.

[139] François Chaslin, "Le Corbusier and Ritter," *Arquitectura Viva* 188 (January 2, 2017), http://www.arquitecturaviva.com/en/Info/News/Details/9557.

[140] Willy Boesiger, Pierre Jeanneret, and Oscar Stonorov, *Le Corbusier et Pierre Jeanneret: oeuvre complete 1910-1929. Vol. 1* (Zurich: Les Editions d'Architecture, 1964), 6.

[141] Boesiger, Jeanneret, and Stonorov, 11.

[142] Boesiger, Jeanneret, and Stonorov, 11.

> "Together [with William Ritter] we wandered across those wide regions of lakesides, uplands and Alps that are pregnant with historical significance. And little by little I gradually began to find myself, and to discover that all one can count on in life is one's own strength."[143]

And:

> "As we [Le Corbusier and his cousin Pierre Jeanneret, with whom he worked together] did not seek for lucrative commission, but preferred to devote ourselves instead to those creative researches which bring their own reward, we have never once agreed to a compromise."[144]

There is more, but the point is clear enough.

Then, there are the standard histories of the box written in the 1930s and 1940s by historians who wanted the box to win. There are several of them, but some of the most important works have been Henry-Russell Hitchcock, *Modem Architecture: Romanticism and Reintegration,* New York, 1929; Nikolaus Pevsner, *Pioneers of the Modern Movement from William Morris to Walter Gropius,* London, 1936 (later much rewritten and republished in 1960 as *Pioneers of Modern Design*); Walter Curt Behrendt, *Modern Building,* New York, 1937; J.M. Richards, *An Introduction to Modern Architecture,* London, 1940; and Sigfried Giedion, *Space Time and Architecture,* New York, 1941.[145]

[143] Boesiger, Jeanneret, and Stonorov, 11.
[144] Boesiger, Jeanneret, and Stonorov, 12.
[145] See Christian F. Otto, "American Skyscrapers and Weimar Modern: Transactions between Fact and Ideas," in *The Muses Flee Hitler: Cultural Transfer and Adaptation, 1930-1945*, ed. Jarrell C. Jackman and Carla M. Borden (Washington, D.C: Smithsonian Institution Press, 1983), http://archive.org/details/musesfleehitlerc0000unse.

Giedion has been perhaps the most influential—"the chief proselytizer of modernism in architecture," as he was once described.[146] He has been very clear about writing his story from the point of view of those who made the box:

> My activities have brought me into friendly contact with the architects of our day. We have sat together in small groups about many tables in Europe, from Stockholm to Athens—not to discuss problems in art or matters of specialized detail but to determine as clearly as possible what directions housing, town planning, or regional planning had to take. This close and continual contact granted me the privilege of seeing architectural problems in their nascent state.[147]

And he made no apologies about it either, writing, "The historian must be intimately a part of his own period to know what questions concerning the past are significant to it."[148]

And:

> "The historian, like every other man, is the creature of his time and draws from it both his powers and his weaknesses. By virtue of his calling he may survey a larger circle of events than his average contemporary, but this does not lift him out of his own historical setting. It is even to his advantage to be forced from his academic chair occasionally and made to participate in the common struggles of the moment. For direct contact with life and its necessities sharpens his abilities to penetrate the jungle of printed records to the unfalsified voices of the real actors.[149]

One can find similar views in the generation that came after, both from historians and from architects who wrote. Here are, for example, the UK architects Alison and Peter Smithson, writing about Le Corbusier:

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[146] Alina Payne, "Architecture, Objects and Ornament: Wölfflin and the Problem of Stilwandlung," *Journal of Art Historiography* 7 (2012): 1–20.
[147] Giedion, *Space, Time and Architecture*, 4.
[148] Giedion, 6.
[149] Giedion, 7.

> "Le Corbusier is a great visionary, and this word to me has a special significance, carrying a more religious meaning than words like idealist or revolutionary. For a visionary can make other people's minds take alight almost as a by-product of his personal struggle. And I hold that without Le Corbusier there would be no modern architecture as an ideal, although there would be modern buildings…"[150]

One can go on and on and on. To be sure, some of the writers who thought of architecture that way would very often acknowledge that they really dislike much of what gets built—but they would then talk of it as though it was a deviation from the pure original vision.[151] Mies himself did it: in 1979, Arthur Drexler, the curator of MoMA, recalled how he once asked the architect how he spends his day, hoping to learn something about Mies's methods. The answer was, apparently, "We get up in the morning, and we sit on the edge of the bed and we think 'What the hell went wrong?'"[152] And later historians wrote that way about the sorts of Mies-like buildings that came after Seagram, but were built less expensively. Here is William Curtis, for instance, in his "Modern Architecture Since 1900" (which got the Alice Davis Hitchcock Medallion of the Society of Architectural Historians of Great Britain in 1984 and, in a later edition, the architecture book prize of the American Institute of Architects in 1997):

[150] A. Smithson and P. Smithson, *The Heroic Period of Modern Architecture* (New York: Rizzoli, 1981), 26.
[151] The press for the less educated tends to echo the dislike, without going into details about the supposedly corrupted original visions. But the less educated do not generally decide what gets built.
[152] Arthur Drexler, "Transformations in Modern Architecture," lecture delivered at the Museum of Modern Art, 10 April 1979 on the occasion of exhibition #1250, Transformations in Modern Architecture, on view 21 February–24 April 1979. Sound Recordings of Museum-Related Events, 79:29, The Museum of Modern Art Archives. Quoted in Felicity D. Scott, "An Army of Soldiers or a Meadow: The Seagram Building and the 'Art of Modern Architecture,'" *Journal of the Society of Architectural Historians* 70, no. 3 (September 1, 2011): 330–53, https://doi.org/10.1525/jsah.2011.70.3.330.

> It is a sad irony of ensuing history that the pure glass prism should have started off as the symbol of new faith and ended up the banal formula for the housing of big business and bureaucracy.[153]

While it is true that many in the 1920s were obsessed with various crystalline imagery for aesthetic and ethical reasons, 'the pure glass prism' that Curtis is referring to—Mies's 1923 proposal for the Friedrichstrasse skyscraper competition—was, from the start, a proposal for an *office.*

The more specialized views are not much different. Giedion stated it well, and most architectural history writing has followed him since:

> …the history of architecture as an enterprise with a continuous and independent growth of its own, apart from questions of economics, class interests, race, or other issues. Architecture is not exclusively an affair of styles and forms, nor is it completely determined by sociological or economic conditions. It has a life of its own, grows or dwindles, finds new potentialities and forgets them again.[154]

Criticisms

There are, to be sure, periodic attempts at critique, especially from the late 1960s onwards. The Journal of the Society of Architectural Historians published an article in 1969 by John Maass titled "Where Architectural Historians Fear to Tread."[155] It criticizes "some American art historians' ritualistic occupation with the trivia of dating, attribution, and provenance [that] certainly epitomizes mock scholarship at its most irrelevant" and then argues, gently, against focusing on "public and private buildings which are associated with

[153] William J. R. Curtis, *Modern Architecture since 1900*, 3rd ed., [Rev., expanded, and redesigned] (London: Phaidon, 1996), 123.
[154] Giedion, *Space, Time and Architecture*, 23.
[155] John Maass, "Where Architectural Historians Fear to Tread," *Journal of the Society of Architectural Historians* 28, no. 1 (1969): 3–8, https://doi.org/10.2307/988523.

the urban middle class"; against "virtually ignoring all non-Western civilizations," manifest in the 251:4:2 ratio of articles covering "civilized," "semi-civilized," and "barbarous" races respectively; against focusing, even within the West, predominantly on American architecture; against not paying much attention to industrial and civil structures (to which only three of the 257 articles in the ten years of articles between 1958 and 1967 referred); against engaging in "façadism" by mostly ignoring the technical aspects of building (only 30 articles had some mention of technology); against ignoring buildings' urban settings and forgetting that "except in the abstraction of drawing or photography no building exists in a void"; and against not paying much attention not just to other disciplines—social science, economics, political history, literature, psychology—but even to other branches of art history. Trying not to sound too negative, the article concludes: "Architectural historians are fortunate because they are working in a field where the surface has hardly been scratched."[156]

Other journals published similar pieces. Here is a summary quote from 1980:

> Some years ago, the editors of the Journal of Architectural Research argued for 'the need to put much greater emphasis on an historical understanding of the economic, functional and cultural aspects of built form and the social conditions within which particular types of built form have evolved' (vol. 5, no. 2, August 1976). Or, in discussing the design process, 'architects translate from social ideas (like "school", "need", "community") into real buildings and aggregates which means that research must be concerned not only with the social ideas on one hand and the physical building

[156] Going back to the 1969 piece and a follow-up 1970 piece by Sibyl Moholy-Nagy ("Maass for Measure," JSAH 29, no. 1 (Mar. 1970), 60-61), the best that a 2015 article in JSAH could say was, "Forty-five years later, architectural history has not become Maass's paragon of interdisciplinarity and inclusiveness nor met Moholy-Nagy's challenge [to prioritize 'new materials and new hypotheses' and to work on 'unexplored regions and aspects of architectural history'] entirely, but their criticisms might be less blunt today." See Patricia A. Morton, "SAH at Seventy-Five," *Journal of the Society of Architectural Historians* 74, no. 1 (March 2015): 5–7, https://doi.org/10.1525/jsah.2015.74.1.5.

> on the other but with the relations between the two. This is currently one of our greatest areas of ignorance' (vol. 4, no. 2, August 1975).[157]

There were also questions asked about specific episodes in architectural history—about, for example, the idea that the box appeared in America because Mies and Gropius came over. Hence the art and architecture historian Christian Otto writing in 1983, somewhat tongue-in-cheek:

> The strong, multifarious, indigenous tradition [of American skyscraper building] seems to have collapsed in less than a decade, and architectural ideas articulated in Weimar became hallmarks of American building from the late 1940s on. In fact, they were declared thoroughly American. How can this extraordinary cultural transference be explained? Did Mies, who began his American career in 1938 as part of the diaspora shaken loose by the political destruction of the Weimar Republic, singlehandedly usurp an entire American tradition? If so, this is a mind-boggling event, the architectural equivalent of something like the Russian Revolution, a phenomenon of apocalyptic proportions for the present and history of the built environment. The annals of twentieth-century architectural history maintain such an interpretation of the transformation of American architectural sensibilities.[158]

And:

> How do we account for the prevalent assumption that the metal and glass high-rise is a Miesian product that proliferated in America once the master arrived on these shores? Presumably, a consideration of this question would take several factors into account, chief among them the character of popular press reports on the built environment, professional and popular criticism, the writing of contemporary architectural history,

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[157] Anthony D. King, ed., *Buildings and Society: Essays on the Social Development of the Built Environment* (London ; Boston: Routledge & Kegan Paul, 1980), 4.
[158] Otto, "American Skyscrapers and Weimar Modern: Transactions between Fact and Ideas," 153.

> and the nature of instruction in American schools of architecture. No review of these materials has ever been pursued, thus preventing any purposeful response for the moment.[159]

Little, if any, review appears to have been pursued since 1983.

There were critiques, too, from the few people who did try to write architectural history in a different way. There was the Venice School—most notably Manfredo Tafuri—but Tafuri's writing is highly erudite and highly arcane: he is known, but not read. There was Reyner Banham, too—better known and better read—who in his introduction to his "Architecture of the Well-Tempered Environment," which was a history of building heating and air-conditioning, wrote:

> …the art of writing and expounding the history of architecture has been allowed—by default and academic inertia—to become narrowed to the point where almost its only interest outside the derivation of styles is haggling over the primacy of inventions in the field of structures. Of these two alternatives the study of stylistic derivations now predominates to such an extent that the great bulk of so called historical research is little more than medieval disputation on the number of influences that can balance upon the point of a pinnacle.[160]

Why the great bulk of "so called historical research" is that way—and it is this way to this day—is not clear. Perhaps it is Banham's "default and academic inertia"—but why did that default and inertia not work as much in the departments history? Why did nobody do for the history of architecture what, say, Hobsbawm or Thompson or Braudel did for history as such?

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[159] Otto, 162.
[160] Banham, *The Architecture of the Well-Tempered Environment*, 13.

Well, it is as with Brecht, who was not a fan of the box ("You need a good black coffee to find something attractive about these reinforced concrete buildings. I read with horror (in the publicity brochure of an American contractor) that these skyscrapers survived the San Francisco earthquake")[161] and who wrote in his famous *Questions from a Worker Who Reads:*

> Who built Thebes of the seven gates?
>
> In the books you will read the names of kings.
>
> Did the kings haul up the lumps of rock?
>
> …
>
> Every page a victory.
>
> Who cooked the feast for the victors?
>
> Every 10 years a great man.
>
> Who paid the bill?
>
> So many reports.
>
> So many questions.

Questions indeed, and mostly of the unasked sort, too. Though one wonders if one might, in the unfolding of time, start getting different answers if one at least starts asking those questions in the first place.

[161] Bertolt Brecht, *Things Which Pass*, 1925, quoted in Hays, *Architectural Theory Since 1968*, 350.

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Books not consulted

There were several secondary works that the works I relied on kept referencing and that I wish I could have consulted. I did not, however, have access to them given the conditions under which I wrote this thesis. These included:

Betsy Hunter Bradley, *The Works: The Industrial Architecture of the United States* (New York: Oxford University Press, 1998).

J. M. Richards, *The Functional Tradition in Early Industrial Buildings* (The Architectural Press, 1958).

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Robert A. M. Stern, David Fishman, and Thomas Mellins, *New York 1960: Architecture and Urbanism Between the Second World War and the Bicentennial*, 2nd edition (New York, NY: The Monacelli Press, 1997).

Phyllis Lambert and Barry Bergdoll, *Building Seagram* (New Haven, Connecticut; London, England: Yale University Press, 2013).

Having consulted these works would have made my argument stronger. As it is, I can only hope that they do not at least contain something that would wholly and convincingly contradict much of what I wrote.