Protocols Don't Build Pyramids

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Summer of Protocols

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«exploded technical diagram of a city block, outlines, technical document, architectural plans»

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IN 2010, a traffic jam formed on China National Highway 110 between Beijing and Inner Mongolia that would last for 12 days and extend more than 60 miles, slowing thousands of cars to a near stand-still, with speeds measured in single-digit miles per day.[1] The size and duration of the slowdown made the mass of stuck vehicles into a temporary, linear city, spawning a local economy of food vendors who catered to truck drivers as they passed the time playing cards. By some accounts, it was the worst traffic jam ever observed.

Notwithstanding extreme cases like China's, there is no historical record of traffic jams. Like a rainy day, a traffic jam is an unexceptional event: statistical noise without a unifying narrative, a cascading slowdown that makes the inciting disruption irrelevant as it engulfs more and more cars. Traffic congestion is not a catastrophe but business as usual, often quite predictable, rising and falling on daily cycles like tides. And while a traffic jam's aggregate cost is quantifiable, in dollars or wasted hours, the pain it inflicts is ultimately personal, experienced as quotidian and arbitrary tedium by thousands of individual drivers. Nothing is less interesting than someone else's traffic jam story.

Traffic Jams as Protocol Friction

Local news media report on traffic in a manner that resembles their weather coverage, as though it's a natural feature to plan one's day around and beyond the scope of anyone's control (which it is). A phenomenon like traffic congestion, having settled into its cyclical equilibrium, eventually congeals into a permanent feature of the built environment, and the traffic-laden roadway is thus a microcosm of the urban landscape as a whole: a layered matrix of material infrastructure (buildings, roads, fiber-optic cables) supporting additional strata of flows (people, money, information), with each layer possessing a different degree of flexibility.

Like traffic itself, the jam is a recognizable pattern that emerges from the interaction of these layers: human behavior, physical infrastructure, laws, and a variety of other forces. However slowly it moves, this congestion is not a static object but a flow, a temporal mismatch between the supply of road capacity and the demand for it. At first glance, traffic jams appear to be a coordination failure—not quite anyone's fault, but rather the emergent product of a self-organizing system. When understood as individual sacrifice in the interest of collective mobility, however, traffic jams begin to blur the distinction between failure and success: by broadening or narrowing one's perspective, either assessment is possible.

Traffic congestion is a representative problem of the contemporary Western city: a chronic tension between the built environment's hard constraints and the fluid, volatile demand for that infrastructure and its various uses—a conflict that, in its worst cases, reverses the utility of a system altogether (like a municipal sewer system overflowing during a storm). Better coordination mechanisms could presumably help, but the tradeoffs necessary for such optimization are often undesirable, entailing higher costs or restricted freedom. As growing vehicular flow approaches the limit of a road's maximum throughput, a traffic jam becomes the most likely resolution, like a packet-switched network suffering from bufferbloat[2] and jitter[3]—an analogy that highlights how cars and drivers are more like a highway's informational content than individuals with agency, at least while on the road. Such outcomes, in their apparent disorder, may seem to indicate the absence of protocols. But they are more likely just symptoms of flawed protocols, or necessary headaches meted out by protocols working as intended.

Traffic jams are a problem that is not meant to be solved but managed—one

1. https://www.telegraph.co.uk/news/worldnews/asia/china/7961325/Chinese-drivers-stuck-in-the-longest-traffic-jam.html

2. https://en.wikipedia.org/wiki/Bufferbloat
3. https://en.wikipedia.org/wiki/Packet_delay_variation

possible approach to the challenge of distributing aggregate benefits and costs among individuals. The jam is a feature of traffic, not a bug—less a failure than the janky avoidance of failure, a necessary compromise, the sufficient but "dumb" management of high throughput. What is traffic, after all, but a multitude of cars on the road, each driver pursuing their own self-interest, using transportation infrastructure for its intended purpose? You aren't stuck in traffic. You are traffic.

Cities and Their Problems

As nodes of concentrated human activity, cities are inherently sites of conflict, as well as systems for resolving that conflict. If civilization is increasingly urbanized, so are its problems. Many of the contemporary city's seemingly disparate troubles, including traffic congestion, are unified by an underlying condition: a mismatch between the built environment and the collective needs of its inhabitants, between physical systems and information flows, between material structures and the ever-changing uses to which they are put.

In the United States and elsewhere, city dwellers grapple with this mismatch in a variety of ways: widespread, often imprecise complaints about gentrification, along with an increasingly polarized debate about the proper solution to declining residential affordability, attest to a dissatisfaction with how access to the built environment is distributed. Other urban areas, meanwhile, face economic decline and population loss, a phenomenon epitomized by the deindustrializing American Rust Belt in the late 20th century. The more recent explosion of remote work has led to a persistent underutilization of central city office space that seems poised to echo that previous phase of urban deindustrialization. Globally scaled problems like climate change and the COVID-19 pandemic have threatened the perceived viability of specific cities, or of cities in general, while exposing flaws in how those cities are organized. Chronic

issues like traffic congestion endure. In all of these cases, the cumbersome base layers of the built environment can't keep up with circumstances that seem to change faster and faster—and in their rigid materiality, how could they?

More fundamentally, there is a prevailing sentiment among individuals that the city they want is unattainable—that they lack the agency to shape the built environment they inhabit, with real estate market conditions, digital platforms, corporate interests, vast infrastructure networks, and inexorable climate volatility superseding more local or individual control of housing, public space, commerce, and other urban systems. This misalignment fuels a desire for a more authentic, participatory urbanism: walkable cities, third places,[4] local community, a flourishing small business ecosystem, and a general reclamation of agency in an atomized, consumerized city.
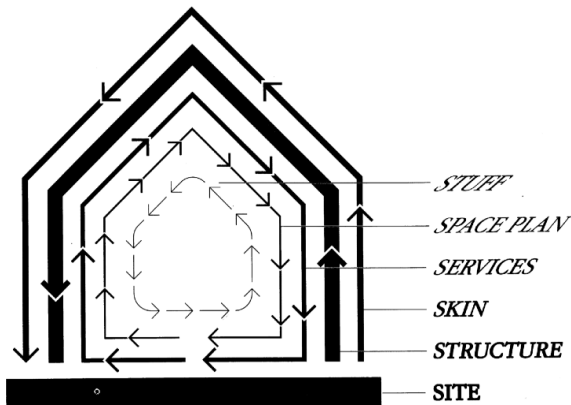
Not only is the built environment *temporally* mismatched to collective needs, it is *spatially* mismatched: the mechanisms for effecting change at local and individual scales are deficient, exacerbating both categories of misalignment. Traffic exhibits this quality too, as a large-scale system that negatively impacts specific neighborhoods or commercial districts while subsuming or overwhelming individual action. As these global forces exert a growing influence over local activities, there is a dearth of agency at more local scales: the individual, the household, the block, the neighborhood, and even the city itself.

The urban environment, again, is a layered system. In his 1994 book *How Buildings Learn,* Stewart Brand quotes architect Frank Duffy's assertion that a building is not a building per se, but "several layers of longevity of built components."[5] These "pace layers" range from the more rigid—the building's site and structure—to the more fluid and adaptable—the interior layout, furniture, and decorative elements. Beyond

4. https://en.wikipedia.org/wiki/Third_place
5. Stewart Brand, *How Buildings Learn: What Happens After They're Built* (New York: Viking Penguin, 1994), p. 12.

its practical insight, Brand's framing offers a broader understanding of how systems evolve over time and how humans live with those systems. Organizational agency, he notes, often corresponds to the pace layers, with faster-changing layers subject to more individual control (a homeowner or tenant) and slower-changing layers stewarded by the community or state.

From Stuart Brand, How Buildings Learn: What Happens After They're Built, chapter 2, "Shearing Layers" (New York: Viking Penguin, 1994)

Perhaps most importantly, Brand observes, the dynamics of a building, city, or any system "will be dominated by the slow components, with the rapid components simply following along."[6]

This is both a blessing and a curse: the slow layers provide continuity, constraint, and stability, while the quicker layers are sources of innovation and dynamism. "But if we let our buildings come to a full stop, they stop us."[7] The tension or "shearing" between the built environment's various layers as they change at different rates is an unavoidable condition, but Brand notes that an adaptive system allows for "slippage" between those layers:

> Otherwise the slow systems block the flow of the quick ones, and the quick ones tear up the slow ones with their constant change.[8]

When the base layers of the urban landscape, being both slow and expensive to modify, are unable to adapt and change as quickly as we'd like them to—when the

hardware can't keep up with the software that runs on it (sometimes literally)—then, in the meantime, we can turn our attention from its more rigid base layers to the more flexible and adaptable upper layers—the parts of the built environment that aren't nailed down, so to speak, and the social, commercial, and informational layers on top of it all.

Those malleable upper layers, as Brand observed, are also more responsive to local and individual influence. It is easier to reorganize the furniture in one's house than to change the building's structure or expand the site on which it's built. Longer-term interventions in the built environment that adapt the base layers to new conditions are still worthwhile—they are as critical as ever—but, for individuals working at smaller spatial and temporal scales, the "software" (and the protocols that mediate it) may be a more fruitful domain of intervention than the hardware.

The traffic jam, again, exemplifies this dynamic, and foreshadowed the broader problem when it first emerged in the 20th century: a coordination challenge bounded by physical infrastructure constraints that make subpar performance seem inevitable—quick systems blocked by slow systems, with insufficient slippage between them (in contrast to the infrastructure for a transportation mode like the bicycle). Aside from limited solutions like tolls, congestion pricing, and HOV lanes, highway traffic protocols amount to a faux-democratic non-decision about how a multitude of overlapping vehicular trips should be organized and prioritized, with little regard for alternative paradigms that might reflect different goals or priorities. (Notably, mobile apps like Waze and Google Maps have emerged as an ad hoc coordination layer for traffic, although they have not changed the underlying paradigm.) Despite the looming prospect of self-driving cars finally rationalizing traffic, most drivers do not expect congestion to go away; our acceptance of the traffic jam is a kind of infrastructural fatalism.

The allocation challenges afflicting many other urban systems, such as housing and

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6. Brand, p. 17.
7. Brand, p. 17.
8. Brand, p. 20.

public space, are versions of the traffic jam. Like traffic jams, they have become so familiar and so persistent that they seem less like problems than like a sort of weather—abiding circumstances we should just learn to live with.

How Protocols Work

To claim that the built environment is full of infrastructurally constrained coordination problems is another way of saying that cities have *protocol* problems. If protocols are coordination mechanisms supported by infrastructure, then cities are dense clusters of overlapping protocols—organizing processes that channel or filter physically grounded behavior in the pursuit of some overarching goal, such as traffic flow, public space usage, or the allocation of housing. In his 1996 paean to the urban street grid, *Ladders*, Albert Pope argues that the widespread expansion of the grid in the 19th century "reconceived the city as an active process rather than a discrete urban plan."[9] As this has become even more true in the time since, the role of protocols in the built environment has grown accordingly.

As with computers, the protocols of the built environment form a supple middle layer between hardware and software, binding the two together by engaging with the specific characteristics of each. Building codes and zoning laws, for example, address both the physical forms of the structures they regulate as well as their uses and externalities.

Broadly, protocols can be understood as *infrastructure plus behavior* (this oversimplifies the concept somewhat but will suffice for now). While protocols often depend upon their supporting infrastructure, they are also separate from it. At the end of Don DeLillo's novel *White Noise*, the protagonist's 6-year-old son rides his tricycle down an embankment and across the busy multilane expressway near their home, narrowly avoiding a catastrophic accident:

The drivers could not quite comprehend. In their knotted posture, belted in, they knew this picture did not belong to the hurtling consciousness of the highway, the broad-ribboned modernist stream.[10]

It is thus possible to occupy infrastructure without participating in its corresponding protocols. Traffic protocols are not the road itself, nor are they the drivers, but a layer that mediates the interaction between those domains—a set of rules, norms, incentives, and design affordances that work together to translate a potentially chaotic range of behavior into a more orderly result. To perhaps state the obvious, not every immaterial process or set of rules is a protocol. Additionally, not every protocol works well. There are certain characteristics that all protocols share, along with a larger set of criteria, such as legibility, that characterize good protocols.

Protocols are essential to cities. The physical concentration of thousands or millions of people and the intersection points of myriad local and global systems, all competing to use the same finite space, are places of constant compromise at every scale, full of externalities that must be managed, boundaries that must be negotiated, and conflicts that must be resolved. From the individual lot to the block to the neighborhood and on up, cities contain sites of potential chaos that only maintain stability via the delicate balancing act that protocols perform, constraining individual agency along certain dimensions in order to extend it along others (but always within limits).

A local street in a dense urban core, for example, must accommodate traffic circulation, pedestrian movement, commercial activity, the interface between public and private residential space, and the wide range of additional activities that happen in the urban public realm. These various systems are often at odds, sharing physical space by necessity. Pedestrians cross the street orthogonally to the flow of cars while delivery vehicles find it expedient to park in bike lanes, risking a traffic citation that may be

9.   Albert Pope, *Ladders* (New York: Princeton Architectural Press, 1996), p. 35.

10. Don DeLillo, *White Noise* (New York: Viking Penguin, 1985), p. 322.

inconsistently enforced. Construction and maintenance work disrupt routine activities in exchange for longer-term benefits, which do not always accrue to the same parties who suffer its inconvenience. Protocols help to manage these inevitable conflicts: shared street usage depends upon a mixture of behavioral patterns and laws, such as pedestrians' right of way in crosswalks, along with physical design elements like street signs, traffic lanes, and curbs. In many places, jaywalking is prohibited by laws that are largely unenforced, giving individuals discretion to decide when such crossings are safe or appropriate.

Defining what a city actually is, and what purpose cities ultimately serve, affirms the importance of protocols: a city is a place of concentrated *exchange* and *interaction*—an active process, as Pope describes it. Urban theorist Michael Batty writes that the city's essential feature is "interactions between different individuals rooted in time and space."[11] Cities are where we meet to exchange money, goods, ideas, and above all, information. This implies a physical clustering of people—the people who are doing the interacting and exchanging, in the forms of commerce, cultural production, and social activity—and while cities are sites of concentrated population, that is secondary to their status as sites of concentrated *interaction*. A city is an information system, a conduit of flow. As architecture historian Kazys Varnelis argues, a city is a communication system, inextricable from the network infrastructure that supports it.[12] (Suburbs and other settlement patterns that are not commonly understood as "cities" also enable interaction, but less densely.)

Viewed another way, protocols are the immaterial apparatus that support and direct the physically grounded information flows that are concentrated in cities and transmitted by urban infrastructure. In her 2014 book *Extrastatecraft*, Keller Easterling describes the contemporary built environment as being increasingly structured by "infrastructure space," an operating system or medium of information that governs the physical realm:

> The information resides in invisible, powerful activities that determine how objects and content are organized and circulated.[13]

Those "invisible, powerful activities" are often protocols. And despite their immateriality, protocols imprint themselves on the physical landscape itself, producing observable patterns that both express the protocols' nature and shape their ongoing performance, in a feedback loop. The design of parks and public squares, for example, often codifies the informal protocols of public space usage (a process documented in William H. Whyte's 1980 book *The Social Life of Small Urban Spaces*).

Cities as Protocols

Where flows of information, human behavior, and physical infrastructure meet, protocols are often found. Not only do cities *contain* protocols within and between systems like traffic and public space, cities also *are* protocols themselves. A city, at its essence, is a localized system for organizing and focusing collective behavior toward coherent goals, like commerce or cultural production. And that is just what protocols facilitate. A more robust definition of protocols is this: *a structured process that organizes participants' behavior in the interest of achieving a collective goal*.

Alfred North Whitehead said that "civilization advances by extending the number of operations we can perform without thinking about them."[14] Protocols embody this process; understanding them this way supports the assertion that cities themselves are protocols, efficiently compressing civilizational knowledge and effort, thereby maximizing others' ability to make use of it. As Lewis Mumford writes in *The Culture of Cities*:

11. Michael Batty, *The New Science of Cities* (Cambridge, Mass.: MIT Press, 2013), p. 30.
12. https://www.youtube.com/live/JsRuk6wu-0Y

13. Keller Easterling, *Extrastatecraft: The Power of Infrastructure Space* (New York: Verso, 2014) p. 13.
14. https://venkatesh-rao.gitbook.io/summer-of-protocols/

What the shepherd, the woodman, and the miner know, becomes transformed and "etherealized" through the city into durable elements in the human heritage . . . Within the city the essence of each type of soil and labor and economic goal is concentrated: thus arise greater possibilities for interchange and for new combinations not given in the isolation of their original habitats.[15]

Protocolization is thus an essential quality of the urban built environment. Cities extend the operations available to their inhabitants by "doing the thinking" for them, enabling more sophisticated forms of interaction than would be possible in rural isolation. Geographic hubs like Silicon Valley, Hollywood, and Wall Street all illustrate the amplifying effects of urban clustering and the shared infrastructure that it creates, but those are only the most visible examples of a phenomenon that every city dweller benefits from. The cognitive burden of city life is likely higher than that of rural life, of course—a density of choices accompanies the density of interactions—but cities' ability to amplify and extend one's actions means that the benefits of that cognitive burden are higher still, encouraging more intensive usage of urban infrastructure.

A protocolized landscape tends to be user-friendly relative to the unprotocolized alternative, at least along the dimensions that align with the protocols' functionality (and at the expense of dimensions that do not). Today, many individuals inhabit a nearly continuous globalized ecosystem of protocolized infrastructure, evoked by metaphors like the "cloud"—in this milieu, an iPhone and a credit card are enough to ensure seamless passage through cities around the world, with relatively uninterrupted access to an array of services like Uber and Airbnb that smooth over the differences between places.

In his 1965 essay "The Great Gizmo," Reyner Banham praised the potent role of the gizmo or "clip-on device" in American culture, which he describes as "a small self-contained unit of high performance in relation to its size and cost, whose function

is to transform some undifferentiated set of circumstances to a condition nearer human desires."[16] Although Banham did not invoke protocols, his essay implies a complementary relationship between protocols and gizmos, with the protocols making gizmos more potent and versatile and gizmos making protocols more useful and usable. Smartphones and cars are both ubiquitous because of robust mobile network coverage and road access; widespread usage of those devices, in turn, creates demand for further refinement and utilization of the protocols and infrastructure that support them.

If the city itself is a protocol, it is also a Russian doll that comprises many more protocols, at every scale. That is, protocols are frequently nested within other protocols, in the built environment and everywhere else. The most complex instances of protocols, such as markets or religions or cities, are made up of countless "smaller" protocols that coordinate narrower subsets of behavior. An auction is a protocol within markets, for example, just as a bid is a protocol within auctions. Likewise, cities function as nodes within global networks, linked via air travel, real estate investment, and circuits of business conferences and trade shows. Within cities, protocols operate at the most local and granular scales, organizing informal retail, parking, interactions between neighbors, and the usage of public spaces ranging from parks to sidewalks.

Like all protocols, those that mediate the built environment possess functionality but lack higher purpose. Every protocol seeks to produce *some* outcome via behavioral coordination, but that outcome may not be worthwhile, and may even be counterproductive in other domains. The protocol itself does not know or care, although its existence implies support for its functional objective simply by making the objective's achievement more likely. Traffic protocols, in this framing, express an inherent affinity for movement by car, as they enable driving from one place to another without any

15. Lewis Mumford, *The Culture of Cities* (New York: Harcourt Brace Jovanovich, 1938), p. 3–4

16. Reyner Banham, "The Great Gizmo" (1965). Reprinted in Penny Sparke, ed. *Design by Choice* (London: Academy Editions, 1981), p. 110.

perspective on the value of a given journey or its particular details. While a protocol's design often *reflects* the extrinsic values system or higher purpose that originally gave rise to it, the intrinsic operation of the protocol itself is independent of those values, and frequently drifts further from them over time.

Cities are no different: they concentrate human interaction and facilitate exchange without answering the question of why such coordination matters (to answer that question with a purpose like economic growth or progress is to beg the question). For this reason, protocols become problematic, or at least unhelpful, within systems that demand such value judgments. Those questions must be answered outside the scope of the protocol itself. Trying to project higher purpose onto protocols is a futile endeavor—one that is all the more tempting when their design hints at the system of values that originated them.

Protocol Failure

If protocols lack any higher purpose, then protocol failure is difficult to diagnose. What does it mean for a protocol to fail, and which subset of urban problems can accurately be described as protocol failures?

When a protocol fails, it does not fail according to external criteria, but according to its own internal objectives. A cryptocurrency protocol that fosters illicit activity via the financial transactions it was built to enable, or a bureaucratic protocol that has become decoupled from any external usefulness but persists by inertia, have not failed by their own standards. Neither has a traffic jam, as discussed above: what matters—what the protocol cares about—is that cars and passengers reached their destinations, however significant or pointless their journeys. A traffic jam highlights the possibility of improved performance, but from the narrow perspective of traffic itself, that congestion is not quite a failure—rather, a driver's decision to forego car travel altogether, for fear of traffic, would be the true failure.

According to its own internal logic, a protocol succeeds to the extent that it is used.

Within a complex ecosystem like a city, this solipsistic quality of protocols means that they have externalities that must be managed—often by other protocols. A protocol that is nested within another protocol, after all, can still fail with respect to the encompassing protocol's objectives while succeeding according to its own. Within a more broadly defined protocol of *regional mobility*, then, a traffic jam can indeed be considered a failure, if the narrow traffic protocol achieves a suboptimal solution by prioritizing excessive driving at the expense of other modes like transit or biking. Zooming out far enough, it becomes possible to question the purpose of the car passengers' trips themselves, and ask whether they should have just stayed home. These questions, again, cannot be answered within the context of traffic itself.

Protocol failure can be hard to identify for other reasons. Many of the best protocols fulfill Whitehead's mandate so effectively that the problems they solve disappear from view, only to reappear when something breaks. We mainly think about how the power grid works when it becomes unreliable, for example. In this sense, protocol failure offers a more complete view of a protocolized system, making the invisible visible. The average person's awareness of protocols, in the built environment and elsewhere, likely suffers from adverse selection: the most visible protocols are the most dysfunctional ones.

There are positive and negative modes of protocol failure. The positive mode creates a tangible problem—garbage piling up on the street, traffic congestion, rising housing costs, crime. The negative mode, however, consists of missed opportunity: the markets that weren't made, the transactions that didn't occur, the value not created. The negative failure mode is more difficult to observe or quantify, but is theoretically infinite. To put it another way, there is always room for protocols to improve.

Protocol failure is ultimately difficult to assess. For chronic urban issues like traffic

congestion and housing shortages, the appearance of failure often masks a system working more or less as designed, but to the detriment of certain participants. The protocol itself does not care, and failure has different meanings at different scales and from different perspectives. Efforts to solve problems that involve protocols, however those problems are defined, must first identify the contours of those protocols, and then understand whether the proper domain of intervention is the protocols themselves or the context in which they operate.

The Urbanist's Dilemma

The field of urban planning, Thomas Campanella writes:

> has been largely unsuccessful over the last half century at its own game: bringing about more just, sustainable, healthful, efficient and beautiful cities and regions.[17]

The contemporary urbanist is stifled by protocols, having failed to adequately recognize or engage with them. "Architects and designers stick to the discrete and the designable," Albert Pope writes, "even as their efforts are undermined by forces far beyond their control."[18] As recent history has shown, urbanists' failure to shape so much of the built environment does not mean that no one has done so, just that other industries like real estate and tech have shaped it instead—and they have shaped it according to their own objectives. As discussed above, the built environment is both temporally and spatially mismatched to the collective needs of those who inhabit and use it, and it is tempting to believe that this is an unresolvable conflict.

Urbanism, as a practice and a point of view, is hampered by its core competency, a focus on the design of the physical environment. The discipline suffers from a bias toward the visible and the tangible—a bias toward built forms. To a hammer, after all, every problem is a nail. Pope continues:

This retreat to the logic of form is a transparent attempt to regain our traditional prerogatives, our fixation on the known and the designable, to the neglect of the actual state of the contemporary urban environment.[19]

While form does matter, it is no longer the primary lever of meaningful change. The overall quality of urban and suburban life has become less correlated with the quality of its physical design and more dependent upon global information flows, market forces, and infrastructural affordances (the two are not mutually exclusive, of course, and many places enjoy both).

As Stewart Brand's model implies, the shearing that occurs between a system's slow and fast layers is a fundamental feature of built structures, whether individual buildings or cities. To somehow eliminate this quality—by forcing solid structures to become flexible or freezing moveable parts in place—would undermine many of those structures' advantages. Demand for various parts of the built environment will always fluctuate, and the volatility of those fluctuations is likely to keep increasing. The true problem is not that this happens, but rather the urbanist's ongoing failure to properly engage with it.

In his 2001 essay "Junkspace," architect Rem Koolhaas offers an ambiguous and backhanded tribute to a protocolized urbanism, which the rest of his piece goes on to describe:

> We have built more than did all previous generations put together, but somehow we do not register on the same scales. We do not leave pyramids.[20]

Much to the dismay of traditionalists who hope to restore a fading vision of the city, the protocolized built environment is not inherently monumental or even photogenic, and must be evaluated according to different criteria. Core urbanist values like walkability and density—the values espoused by Jane Jacobs and codified by the profession in the subsequent half century—have been

17. https://placesjournal.org/article/jane-jacobs-and-the-death-and-life-of-american-planning/
18. Pope, p. 5.
19. Pope, p. 5.
20. Rem Koolhaas, "Junkspace," *October 100* (Spring 2002): 175–190.

historically correlated with the centers of European and prewar American cities, which happen to be aesthetically legible and visually appealing (partially due to nostalgia). The failure of any competing urbanist paradigm to emerge in the intervening decades suggests a lack of imagination at best and an abdication of responsibility for the built environment at worst.

Today, we no longer build pyramids, or cathedrals, or Venice (unless you count the simulacra found in Las Vegas or Disney World). Protocols don't require monuments and they don't generate them. This is not for lack of ability, obviously, but rather a shift in priorities as well as the processes that create the built environment. Today we build fulfillment centers, freeways, container ships, and supertall skyscrapers, all accidental monuments to the various protocols that utilize them, and equally impressive (but usually more esoteric, largely appreciated by the "protocol literate"). Unlike cathedrals and pyramids, the charismatic qualities of protocol monuments are likely to be incidental, a side effect of their primary purpose. Like computer hardware, they are often not even meant to be seen—only indirectly, through the output of their software.

The people who claim to still want literal or figurative cathedrals are rarely the ones shaping the contemporary built environment. If they were, they would likely realize they wanted something else instead. And when they do get their cathedrals, they come in the form of marketing content or superficial decoration that disguises otherwise unassuming infrastructure space.

It's possible that much of "urbanism" as we know it today is a kind of pyramid or cathedral—a red herring that reflects our bias toward the concrete and the visible at the expense of protocols, which already mold the built environment whether we choose to acknowledge them or not. To bemoan the unflagging prevalence of suburbia and the junkspace that Koolhaas describes is to miss the point: those arrangements have clear problems, yes, but urbanists should inquire why so much of the built environment has escaped their purview,

only to get their attention later as an object of knee-jerk criticism. When human settlement is successfully protocolized, it no longer must wait for anyone to plan it. The same is true of the massive informal settlements that have flourished on the margins of cities around the world: permissionless urbanism for populations who can't access the official version.
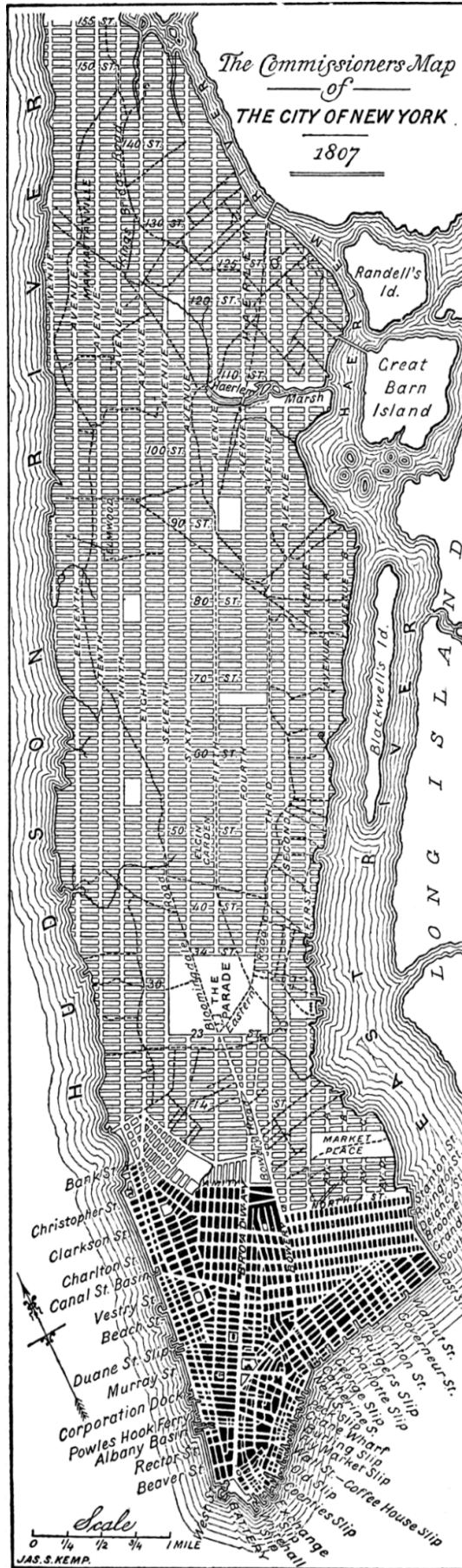
Traffic congestion is notorious for being a problem you cannot simply build your way out of. Expanding highway capacity induces additional demand following a period of temporary relief, ultimately settling at a new equilibrium that is as bad as the original congestion.[21] Occasionally, new road capacity even makes the problem worse.[22] The intuitive explanation is that drivers have a congestion tolerance and will increase the amount they drive as long as that threshold is not exceeded, but more fundamentally, traffic congestion is an inherent feature of traffic protocols.

Protocol problems exhibit this quality more generally: although infrastructure, broadly defined, is a prerequisite for protocols to work, infrastructure is not enough to ensure that they do work. Protocols are supported by infrastructure but also separate from it, such that changing the infrastructure doesn't necessarily change the protocol. Like traffic, then, we can't build our way out of protocol problems—we need to tweak (or overhaul) the protocols themselves. This is a more complex and uncertain endeavor than simply building, which is perhaps why we avoid doing it, and why bad protocols become intractable and endemic: in many cases, they can only be fixed by stepping outside of the protocols themselves, and addressing the broader context in which those protocols operate. Traffic protocols, in other words, will not solve the fundamental problem that traffic represents.

In a 1994 essay, "What Ever Happened to Urbanism," -Rem Koolhaas articulates a vision for a protocolized approach to urbanism, in contrast to efforts that had remained

21. https://www.sciencedirect.com/science/article/abs/pii/S0967070X18301720
22. https://en.wikipedia.org/wiki/Braess%27s_paradox

https://en.wikipedia.org/wiki/Commissioners%27_Plan_of_1811#/media/File:NYC-GRID-1811.png

fixated on built forms, master planning, and traditional ideals:

> If there is to be a "new urbanism" it will not be based on the twin fantasies of order and omnipotence; it will be the staging of uncertainty; it will no longer be concerned with the arrangement of more or less permanent objects but with the irrigation of territories with potential; it will no longer aim for stable configurations but for the creation of enabling fields that accommodate processes that refuse to be crystallized into definitive form . . . it will no longer be obsessed with the city but with the manipulation of infrastructure for endless intensifications and diversifications, shortcuts and redistributions.[23]

Nearly thirty years later, the relevance of Koolhaas's words continues to grow. Good protocols, more than comprehensive physical design, enable the staging of uncertainty, the irrigation of territories with potential, and the accommodation of unanticipated opportunity (protocols and physical design can complement each other, of course). Protocol literacy—for individuals, groups, and institutions—is more than just a means of appreciating the monuments of the contemporary built landscape. It is a path to efficacy.

The Grid: Toward a Protocolized Urbanism

Traffic congestion represents a particular kind of modern drudgery: the unpleasant second-order consequences of new technology, expressed in Frederik Pohl's assertion:

> a good science fiction story should be able to predict not the automobile but the traffic jam.

Protocols are often generative, catalyzing an array of unforeseen outcomes beyond the specific problem they address. But those emergent outcomes aren't always good. Flawed protocols like traffic create bad surprises.

Good protocols, on the other hand, create good surprises—hence Koolhaas's call

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23. Rem, Koolhaas, "What Ever Happened to Urbanism." In *S,M,L,XL*, edited by Jennifer Sigler (New York: Monacelli Press, 1995), p. 969.

to "irrigate territories of potential." In the century before traffic became an everyday concern, another protocol, the urban street grid, emerged as an equally fundamental organizing principle of the modernizing built environment. Albert Pope writes in *Ladders*:

> As they were grafted onto historical urban cores, the 19th-century grid extensions did not so much represent planned entities, but the initiation of a system . . . that preempted the need for future episodes of planning.[24]

Pope makes a compelling case for the grid as a successful protocol—generative, legible, and flexible enough to accommodate the slippage between the built environment's temporal layers. In its apparent simplicity, the grid is imperfect but good enough, reproducible, extensible, and widely applicable, reconciling a range of urban activities and enabling a self-organizing, unplanned form of urbanization. Although the grid had ceased to be the default arrangement of urban growth by the 20th century, Pope writes, its residual presence in cities serves as an ongoing reminder of its generativity:

> The bond between gridded space and urban development is related to the grid's inherent ability to generate systems of infinite complexity. Its ubiquitous power comes from the manner in which it conceals this complexity beneath an otherwise simplistic pattern of organization... It is not the simplicity of the grid that accounts for this elaborate social topography; it is its deference to complexity that supports the wide range of its adaptive heterogeneity—to be the enabling apparatus of such an unlikely collection of things and events.[25]

In a way, the grid's permissiveness as a spatial organizing system is the opposite of traffic's self-sorting autonomy. Traffic surprises us with hard constraints; the grid surprises us with expansiveness and adaptability, demarcating new territory for urban development well before any buildings or people arrive. As a protocol, the grid is far from perfect, but it is both flexible and constrained in the right ways. Traffic is both flexible and constrained in all the wrong ways.

Protocols don't build pyramids. But the grid may be the closest thing we have to a protocol monument, so fundamental to our perception of cities that it is hidden in plain sight. Seemingly humble in its understated simplicity, the grid is as audacious as it is visible and comprehensible, promising to extend infinitely outward and map the world onto its coordinate system. Although the grid itself no longer furnishes the guiding logic of urban expansion, urbanists would do well to learn its lessons and seek their own grid-like protocols—even if the autonomy those protocols enable threatens to make central planning unnecessary. At their worst, protocols create traffic jams. At their best, they can be something more enchanting: as Pope writes, "the concrete configuration that gives access to a greater, unknowable whole."[26]

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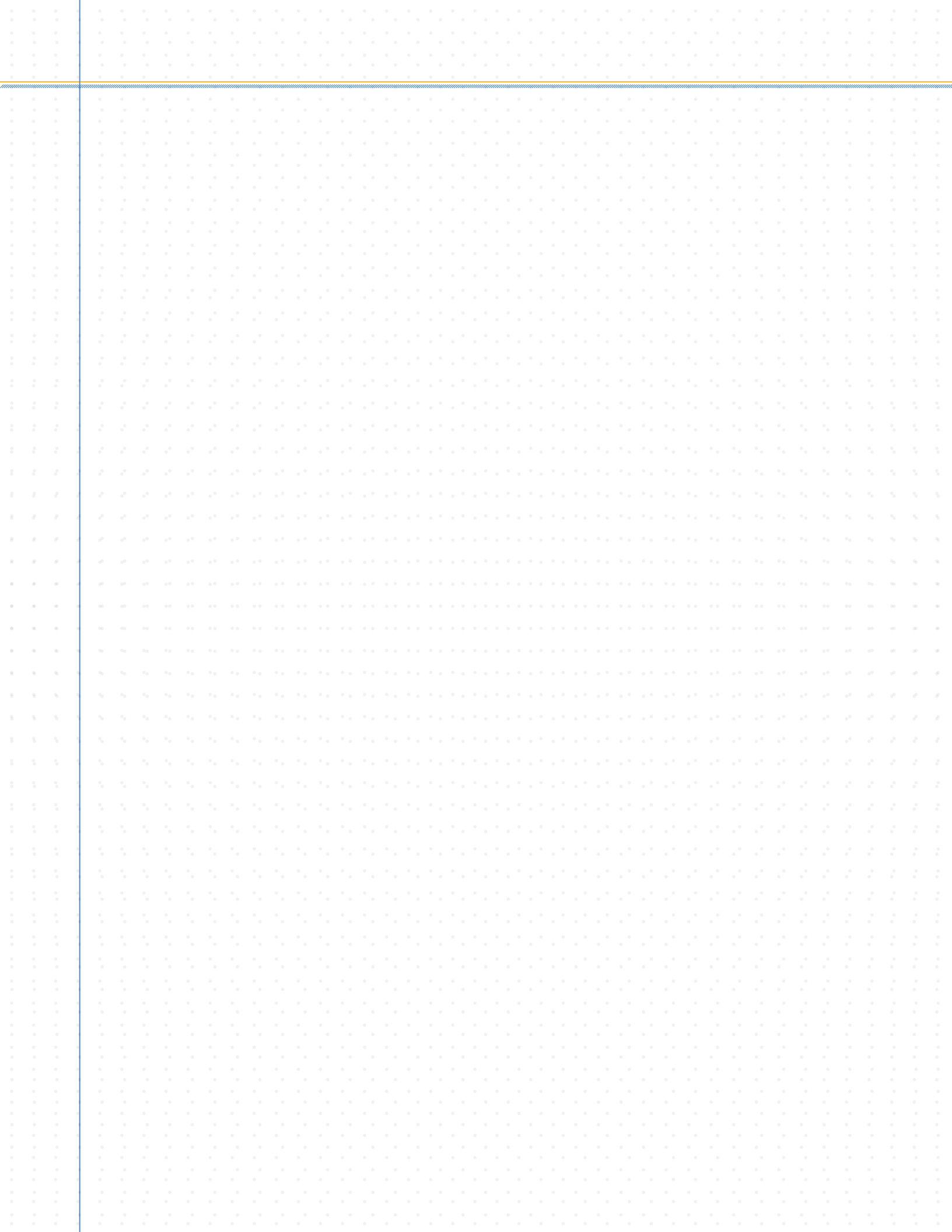
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24. Pope, p. 33.
25. Pope, p. 19.

26. Pope, p. 21.

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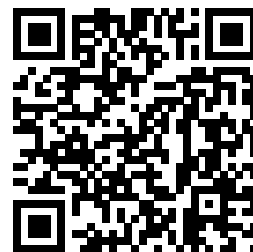Whyte, William H. 1980. *The Social Life of Small Urban Spaces.* New York: Project for Public Spaces.

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