

"AUTO—" presents the prehistories and possible futures of automobilization as a means for investigating automation, autonomy, automaticity, and autonomous vehicles. As a prefix, "auto" presents a paradox. It typically means self, but the legacy of the term is rife with both system contingencies and interdependencies. The automotive paradigm presents an ideal metaphor for parsing the evolution of automation and its critical pivot to planetary scale. This article explores the pathologies that inform platform automation and the potential for a future automobility that centers environments rather than devices in its design.

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EDITORIAL

The physicalization of computation in machinic systems is a form of automation. But what is automation really? What is its deeper immediate history? "Auto," explores the paradox inherent in the prefix "auto" (self), arguing that concepts like automatic, automated, autopoietic, and autonomous often disguise the deep dependencies between self and system, device and environment. The automobile is presented as the prime example of this paradox, shaping the 20th century through "platform automation"—a term coined here to describe the consolidation and distribution of organizational, infrastructural, and computational systems, pioneered by Ford.

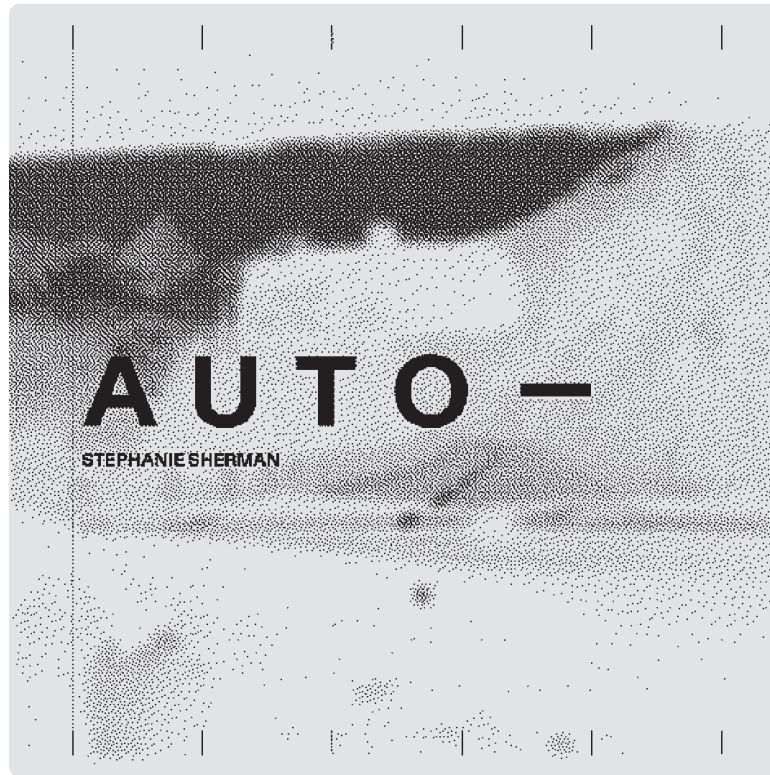
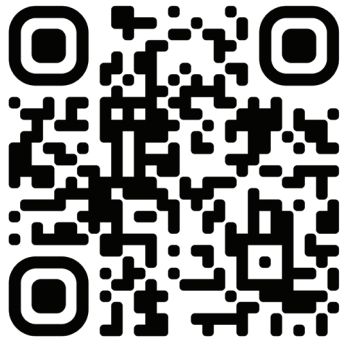
Automation is not merely the displacement of human labor by machines, but as a broader planetary and evolutionary principle involving the externalization and embedding of processes into persistent structures and protocols. Platforms (hardware, software, organizational structures) enable this automation by standardizing elements, allowing interoperability and programmability. With AI, platform automation shifts towards learning and cultivation rather than just programmed prescription.

Ford's automotive complex instantiated this planetary platform automation, bending global infrastructure, economies, and even geology (the Anthropocene) to its logic. This era, driven by the car's contingent dependencies (carbon power, ideologies of individual freedom), is termed the Autocene, an age where humans inadvertently designed a planet for machines. The text speculates whether the current evolution towards Autonomous Vehicles (AVs), transforming cars from machines to robots integrated into city-scale platforms, can reorient this trajectory.

Automation's history at Ford, from assembly lines linking machines ("death of the operator") to Diebold's concept of self-regulating systems, reveals its deep connection to computational logic and systems thinking. Automation is presented as an evolutionary dynamic, embedding decisions into infrastructures (the "platform unconscious") and freeing cognitive capacity. This is linked to psychological concepts of the automatic, contrasting psychic determinism (Freud) with the embrace of chance (Surrealism) and momentum (Futurism), ultimately favoring momentum over motive as the driving force of large systems.

The concept of autopoiesis (self-generation) is critiqued for its focus on self-containment, arguing it masks the external dependencies crucial to any system, including the automotive one. The road system exemplifies autopoiesis leading to suboptimal, path-dependent outcomes. True progress requires moving beyond individual reproduction towards environmental orchestration.

Finally, the essay examines autonomy, particularly in AVs. It traces the history of automatic features in cars and the development of SAE levels of automation, noting the challenges aren't just technical but environmental and systemic. True autonomy might be redefined not as independence, but as interdependence within a coordinated platform, a "freedom from" conscious control enabled by automation. The text touches on the "autodestructive" pathologies of car culture (risk, crashes, ecological impact), suggesting platform automation might channel these drives from individual destruction towards systemic regeneration and coordination.



AUTO

The more you drive, the less intelligent you are.
—Repo Man, 1984

1. Bratton, Cognitive Infrastructures.

prefix riddled with paradoxes

In the history of philosophy, these paradoxes have been formulated most poignantly in the struggle to delineate the boundary between autonomy and necessity, or freedom and determinism. Think Immanuel Kant's third antinomy of reason, pitting spontaneity of will against forces of causal determination, or Marx's famous statement in *The Eighteenth Brumaire of Louis Bonaparte*: "Men make their own history, but they do not make it as they please."

From automatic to automated, from autopoietic to autonomy, the prefix *auto* almost always refers to "self," and it almost always implies something autogenic—self-generating, self-sustaining, self-powered, self-sufficient. In this sense, *auto* is, and has always been, a **prefix riddled with paradoxes**. The problem is that this heuristic, of the self-contained and the self-driven in the deployment of *auto*, *disguises* the myriad dependencies that shape any *auto*-process, concealing the contingencies between self and system, device and environment, power and mechanism, body and brain, motive and momentum, drive and desire.

No legacy of "auto" demonstrates this conundrum more clearly than the automobile, which, over the course of the twentieth century, put the promises and pathologies of "auto" in philosophy and practice. No company was as instrumental to platform automation at this pivotal point as Ford. The Ford Motor Company programmed a platform of platforms, pioneering a planetary phenomenon we will call "platform automation": a process of consolidating and distributing organizational, infrastructural, and computational systems. Ford led the pioneering instantiation of global mass assembly, the coining of the term "automation" at Ford Motors that coincided with the cascade of computational technologies following World War II, and the development of the mission control center of the Apollo moon landings. Today, as artificial intelligence takes shape as various physicalized forms of *automated intelligence*, the genealogies of Fordist automobility present strange and unexpected perspectives on *auto* and its contingencies, a prehistory of computational force. Primal scenes of platform automation lurk within the long-fabled stories of Fordist technological acceleration, modern progress, and geopolitical manipulation, now a speculative history in an alien guise that is shaping the purportedly "autonomous" future to come.

evolutionary process of externalization

What Stephanie points out here can be rephrased - using the jargon of The Extended Evolutionary Synthesis - as automation being an exemplary principle mobilized in niche construction. More on EES and niche construction:

<https://royalsocietypublishing.org/doi/10.1098/rspb.2015.1019>

Rather than presuming automation to imply the displacement of human labor or intelligence, what follows understands automation as a *planetary* principle, rejecting the preconception that automation is limited to *mechanization* or the *mechanical*. This perspective positions automation as an **evolutionary process of externalization** and embedding that programs repeated formations into path-dependent, persistent structures and protocols that simultaneously constrain and enable possibilities. This produces contingent and dependent cascades between action, production, and solidification while predicating future automations [1].

Platforms make automation possible. Platforms build on platforms, generating *platforms of platforms* that enable complex systems to function and interoperate. Platforms are a particular type of system, a kind of infrastructure that can be found in hardware and software, from tectonic plates to urban plans, from media channels to oil rigs, from mobility and transport platforms to architectural typologies, from party positions to state projects. Platforms are foundations—architectures and infrastructures that enable other things to occur. Across domains, platform systems exhibit particular dynamics: they simplify in order to proliferate, consolidate and centralize in order to disseminate and decentralize, fix standards and rules in order

developed or cultivated

Risking the use of too anthropomorphic language, one can read this statement as an identification of an innovative, entrepreneurial drive within platform automation - something that resonates well with Thorstein Veblen's analysis in *Theory of Business Enterprise* or with classics of evolutionary economics such as Joseph Schumpeter's *Theory of Economic Development*.

arguably, no territory remains unaltered

Recent studies conclude only ~3% of the Earth's land is still "faunally intact" (where this means biodiversity hasn't been impacted by human influence).

See A.J. Pumpre, et al. "Where might we find ecologically intact communities?", *Front. For. Glob. Change*. 4 (2021), <https://doi.org/10.3389/ffgc.2021.626635>. There is even plastic waste at the bottom of the Mariana Trench, at a depth of 10,975 meters below the ocean surface.

from singular machine to computers on wheels

The paradox of autonomous vehicles is that while automobility is coded in many cultures as the peak of individual liberty, the evolution of the automotive industry now takes the turn towards seemingly stripping the driver - the sovereign individual - of its liberty vis-à-vis the technological infrastructure of the planetary computation. My hope is that this is the beginning of the automotive industry's coming of age, heralding a larger transition to "mature technosphere", as Adam Frank would say with his colleagues. Perhaps one day, our descendants will look at the first 200-250 years of automobility as a brief, tumultuous chapter from the prehistory of automation.

to enable emergence and diversification, and segment and differentiate in order to integrate [2]. Because platforms coordinate composites, they tend toward increasing their scope and scale, which builds on their ability to merge the top-down and bottom-up, combining centralization and decentralization.

Platform automation is the process of programming. Platforms standardize things, which enables interoperability and programmability, which enables automation, which advances further platform development. This legacy includes biological, ecological, and synthetic code—from cellular reproduction to geological shifts to ecosystemic adaptation. As synthetic intelligence shifts computational capacities from programming to learning, platform automation increasingly refers to a set of parameters and processes through which things are **developed or cultivated** rather than simply prescribed, programmed, or predicted. This potentiates a shift in the focus in platform automation from agents to environments, from individual to social intelligence. This in turn requires a paradigm shift that harnesses computation as a perpetual motion machine that requires steerage and direction and recognizes itself as part of a force rather than an agent of control.

The Fordian automobile instantiated a planetary infrastructure that would be increasingly organized by platforms (from coordination to physical and cognitive prosthetic extension in cars to computers to phones and organization: protocols, policies, industries) and dependent on automation (from delegation to decision-making to development and designation). As the automotive platforms persisted, the planet bent to the world wrought by the automotive complex in perverse and irrational ways. Geographer Ronald Horvath describes the geographic proportion of territory devoted to the movement, storage, or servicing of automobiles as "machine space," [3] the physical infrastructures on the planet that are prioritized for motorcar machines—roads, parking lots and parking spaces, gas stations and pipelines, maintenance shops, production factories, sites, etc. Human dwelling dispersed and highways cut through cities as the automotive complex prioritized cars and trucks over other forms of more efficient transit, such as walking, trains, ships, or bicycles. The automobile not only dramatically organized machine space but also machine time, in terms of the human labor resourcing, manufacture, tracking, purchasing, maintenance, repair, and design of automobiles and the infrastructures, organizations, policies, and services that support them.

The automobile defined not only a modern technological paradigm but also a political and philosophical one, orienting social ideology around freedom and escape, individual desire and lack of compromise. It presented the world as a movie and infiltrated cinema with shiny speed. It bent national boundaries, orders, and constructions in its image, achieving global infiltration and advancing a planetary psychosis. It entrenched the dependence on fossil fuels and regulatory political stalemate, setting in motion a trajectory of planetary suicide seemingly impossible to break.

Mass motorcar proliferation not only shifted machine time and human time, but it also accelerated geological time, instantiating the period now unofficially termed the "Anthropocene," the era of planet Earth in which, **arguably, no territory remains unaltered** by human presence. Through ubiquitous auto-centrism (albeit it hit countries, cultures, and regions at various degrees), the planet succumbed to a great deluded irony. *The Anthropocene can be characterized as an era in which humans thought they were designing a planet for humans, but were in fact designing a planet for machines.* [4]

A more speculative history of auto, one that looks back on the second Industrial Revolution from a future vantage, imagines that alongside this human-centric Anthropocene that solidified auto-centrism, propelled by the automobile's contingent web of dependencies on carbon power and ideas of self oscillating between extreme freedom and contingent construction, another period—the *Autocene*—was simultaneously coming into being. The *Autocene* encapsulates not only everything the automotive complex mobilized at the onset but also the entirety of the physical and psychopathological networks instantiated by the planetary interconnectivity of hardware and software.

The Autocene is a largely incomplete age, a period born out of a seemingly impossible wicked problem in its first phase that contains the potential for a profound reorientation in its later evolution. Is it possible that the maladies of the Autocene contain the unprecedented and unanticipated components of a more rational mobility system? Or would the drives that compelled this disaster always undermine such an effort?

Autonomous vehicles (AVs) today have the potential to reposition the trajectory of the automotive complex. They are driving the evolution of the Autocene, pivoting not only power (from gas to electric) and the position of the driver (what we describe as the "death of the operator"), but also advancing an interconnected platform stack of security, navigation, and sensing technologies capable of operating as a trustworthy mobile exoskeleton at the level of the device or vehicle and at city and planetary scale.

As the automobile shifts from machine to robot, it shifts the paradigm of mobile computing **from singular machine to computers on wheels** operating at swarm-scale platform automation. Rote industrial mass assembly evolves toward modu-

2. Bratton, Stack, 48.
3. Horvath, "Machine Space," 168.
4. Sherman, "Autocene."

from singular machine to computers on wheels

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lated and memory-driven platform assembly systems that produce and leverage learning and intelligence. Planetary computation as a whole will continue to be influenced by automotive spillover technologies and mobility constructs, as it is where physicalized AI meets the public streets. Technological steerage and regulation will play an ever-critical role in accelerating technological development by stimulating innovation and establishing constraints, ensuring the safety of these technologies and determining their public value.

The outcomes will be more than just practical or literal. The philosophies of the automobile are deeply entrenched in common language—step on the brakes, in the driver's seat, take the wheel, running on fumes, shifting gears, roadblocks, steer clear, go the extra mile. Just as the horse defined an energetic metric and vocabulary that persisted long past its prime, the automobile persists as a linguistic, symbolic platform of meaning-making and technological understanding and misunderstanding, shaping the drives of automation and automaticity across scales. Breaking this persistent path means confronting its constructions through new twists and terms.

What follows reviews the Fordian *automotive complex* as a planetary turn, in which platform automation and its propulsive dynamics started to congeal, revealing a prehistory of computational force. This is a history full of liberation and devastation. It reframes the philosophy of automation and automaticity as neither fully autonomous nor something to be feared for its increasing autonomy, but as an inevitable trajectory to be leveraged, for its inevitable and inextricable dependencies and contingencies. In their nascent potential and in their most deviant perpetrations, Fordist drives continue to shape a post-post-Fordist planetary platform automation to come.

AUTOMATION: FROM SIMULATION TO STIMULATION

We are entering an age when the buttons push themselves.

—John Diebold, *Automation Pilots a New Revolution*

The Death of the Operator

The term "automation" was coined at Ford Motor Company by Vice President of Manufacturing Delmar S. Harder in 1946. This coining coincided with a number of pivotal breakthroughs in computation that emerged from World War II-related technical innovations, including cryptography, electrified calculation, and ballistics. That year, women—referred to as "computers"—programmed ENIAC (Electronic Numerical Integrator and Computer), the first electronic, general-purpose, Turing-complete digital problem-solver at the University of Pennsylvania. In St. Louis, the first mobile phone service was inaugurated by Bell Labs, connecting an automobile's engine and radio transmitter to telephony and thus enabling virtual communication on the move.

The school of "cybernetics" led by Norbert Wiener blossomed. Back in 1834, French philosopher of science André-Marie Ampère had used the term *la cybernétique* to refer to the art of governing, drawn from the Greek *kybernetes*, meaning "navigator" or "steersman." Wiener's cybernetics defined an interdisciplinary field of study investigating control and communication in mechanical and computational systems, including feedback, coordination, and management. The term "automation" seemed to encapsulate the new emphasis of programmable relationships for a world increasingly shifting from clocks to code.

At Ford Motors, the new automation department developed integrations for sensing and feedback applications into Ford products and processes. At Ford, automation was not framed as a new phenomenon but was rather understood as a critical step in the evolution of mechanization, following on from the famous electrified assembly line that enabled the mass production of Ford's Model T from its inception in 1914. Fordist *mechanization* had been enabled by continuous breakthrough choreographies of stringent precision protocols—mass production was made possible by vertical and horizontal integration, standardized parts increasingly produced in-house with an ever-diminishing tolerance of differences, repetitive labor bolstered by high wages, and a steady resources flow sourced from global locations. This enabled a predictable calculation of time and resources that flowed into regimented production.

The term "automation" at Ford referred to the process of "transfer automation," whereby various independent machine processes—pressing, sorting, cutting, pasting, welding, twisting, scanning—were linked by positioning devices that provided a continuous, unstaffed production flow between sub-constituent parts of assembly. Automation connected machine to machine without a human intermediary, eliminating the need for operators on the factory floor.

In 1954, as tensions about the future of automation and the impact on labor reached a political pitch, including congressional hearings, Ford's automation department doubled down on the notion that despite being a new term, automation was an extension of a process that Ford had been pioneering all along. "We do not believe that automation, as we use it, is a revolutionary development in production technique; rather, it is just another evolutionary phase of our advancing production tech-

since the advent of the wheel

Sherman is paraphrasing Diebold directly here, but one could argue that automation began much earlier. That is, with the harnessing of fire and invention of cooking: you get heated pots to do the digesting, instead of our stomachs, thus 'automating' the nutritive process. See R. Wrangham, *Catching Fire: How Cooking Made Us Human* (London: Profile Books, 2009). The wheel was invented around 4000 BC; human control of fire began orders of magnitudes prior to this.

nology.” [5] Henry Ford had described the power of mechanization without human oversight in his bestseller *Today and Tomorrow*, published in 1926. “In the Chicago plant, the greatest distance any material has to be trucked is twenty feet, this being the distance from the incoming freight car to the first conveyor. After this it is mechanically handled during the entire process of assembling it into a finished car.” [6]

The term “automation” was concurrently deployed by Harvard management consultant John Diebold in 1946, who describes how the oft-used term “automatization,” which was itself short for “automatism in production,” was a veritable “tongue twister.” [7] Diverging from Ford’s prevailing argument of continuity, Diebold characterizes “automation” as a new paradigm distinguished by the potential to fully mechanize mechanical or computational production processes. For Diebold, automation was a phenomenon specific to an age in which machine independence became possible through programmed control and predetermined decisions. He argues that even though automation was rightly understood as an evolutionary extension of a long process of mechanization that had been developing **since the advent of the wheel**, it also marked a distinct breakthrough in machine coordination, digital sensing, and feedback in physical work. Notably, Diebold understood this evolution in terms of tools and technicity, which, it could easily be argued, go back much further than the wheel. “If automation means anything at all, it means something more than mechanization. It implies a basic change in our attitude and manner of performing work. It is a new way of organizing and analyzing production concerned with the production process as a system, and a consideration of each element as part of the system. It is something of a conceptual breakthrough as revolutionary as Henry Ford’s concept of the assembly line.” [8]

Diebold’s quip about said paradigm shift, “an age when buttons push themselves,” [9] encapsulates all the vicissitudes of this purported epoch of automation and the limitations of iterative imagination. It was an age where buttons still existed.

Diebold described automation as a “manufacturing philosophy” that goes beyond being merely a technology. It demands, he insisted, a thorough analysis of the entire production process, from raw materials to the finished product, ensuring that each step contributes as efficiently as possible to the enterprise’s overall objectives. “Automation is not a particular group of new machines or devices. It is a new concept—the ideal of self-regulating systems—and a new set of principles.” [10] *Encyclopedia Britannica*’s entry on “mass production,” ghostwritten by Henry Ford in the 1920s, points to this whole-systems approach in planning an operation down to the last detail. “Mass production is the focusing upon a manufacturing project of the principles of power, accuracy, economy, system, continuity, and speed.” [11] A precision choreography of the entire process was required to establish and maintain the steady operation of the assembly line in the first place, from the machining of precision parts to the procurement of resources to the high pay that kept people manning the line and ensured the distribution and sales of what it put out. Ford Motors knew from the outset that whether through advanced mechanization or automation, the organizational cascades required to orchestrate and integrate new technologies were not only feats of mechanical engineering. They included organizational, social, and political technologies that were engineered alongside innovations in hardware and software.

Management scholar James Bright performed extensive case studies of the impact of the new phenomenon of automation on organizations and management systems. He astutely describes automation as a technological phenomenon distinguished by advancements *relative* to whatever existing milieu of mechanization it evolved from. [12] According to Bright, automation referred to something significantly more mechanized or automatic than its previous iteration.

Ford of course hadn’t *invented* the moving assembly line for car production. He famously lifted the idea from a moving meatpacking disassembly line, which drew on an incredible lineage of linear and regulated production techniques—from Chinese pottery to shipbuilding to brickmaking. The real Fordist innovation was the *integration* of updated technologies such as electrification and *iteration*—perfecting a coordination and choreography of electrified mass production within an even broader global matrix of labor, material resources, standardized parts, and machines that made machines.

With Fordist automation, humans were fully relieved from the *manual* day-to-day work of operating the machines. People were still required to design, program, organize, arrange, clean, maintain, manage, oversee, and supervise the machines. The dawn of so-called automation marked the death of the operator on the factory floor. Now, over a century later, the same principle is being realized in the operation of the automobile itself, freeing the driver from pitifully glorious routine operations and those delusions of control that prevent humans from pursuing a higher purpose.

5. Automation and Technological Change: Hearings before the Subcommittee on Economic Stabilization of the Joint Comm. on the Economic Report, 84th Cong. 53 (1955) (statement of J. D. Davis, vice president of manufacturing, Ford Motor Co.).
6. Ford, *Today and Tomorrow*, 113.
7. Diebold, *Automation*, ix.
8. Diebold, “Life under Automation.”
9. Diebold, “Automation Pilots.”
10. Diebold, “Automation as a Management Problem.”
11. Ford, “Mass Production.”
12. Bright, *Automation and Management*, 222.

Charles Babbage closely studied the factory and its division of labor

Babbage's observations made me think of the Hungarian choreographer Rudolph von Laban, an intellectual father of modern dance. Besides his system of objective notation and analysis of human motion, he spent years developing a diagrammatic catalogue of movements humans perform on factory floors, thus setting the stage for developing rules of movement translatable to machines.

machines that make machines

Marx described the ways in which machines, though originally made to serve human interests, increasingly seem to dominate human resources. What was once mere means, for furthering our interests, drifts toward becoming an end-in-itself, whereby we risk our lives and expend our energy to upkeep the machines. Instead of serving people, people increasingly seem to serve machines. Marx called this the "thingification of persons" and "personification of things". See K. Marx & F. Engels, *Marx-Engels-Werke* (Berline: Dietz Verlag, 45 vols., 1988), vol.23, 129. Samuel Butler elaborated a similar insight, with imaginative flair, in his 1863 'Darwin Among the Machines'. See S. Butler, 'Darwin Among the Machines', *The Press*, Saturday, June 13, 1863.

Platform Programming

The chassis of the Model T is the foundational base on which the wheels and drive shaft connect, a standardized platform on which the rest of the car was built. This was also the first car part to be automated. A. O. Smith & Co., working with Ford, had already figured out how to eliminate humans from the physical manufacturing process of the chassis by 1908. Platforms and automation evolved in tandem. General Motors (GM), later competing with Ford on the margins of styling and cultural variability, would instantiate what it referred to as a "platform strategy." This meant that GM produced standardized chassis with a variable and customizable design to try to appeal to global customers. In this case, a highly standardized platform centralization enabled a highly variable and responsive decentralization of design. This wasn't so different from the Model T, which also offered a range of styles and designs particular to its buyers, but all were built on the exact same base.

The analytical engine was the first modern computer, a machine running on steam that could perform calculations that previously only a human computer had done. Before designing it, **Charles Babbage closely studied the factory and its division of labor**. *On the Economy of Machinery and Manufacturers* deconstructs the entire British factory system: the process of procuring raw materials, the mode of organizing workers, the disappearance of middlemen, the allocation of prices, the geographic positioning of factories, the importance of scale and velocity in realizing overall productivity, the impact of wages, and the dynamics of management. One passage discusses the factory and the division of labor as advantageous to both "mental and mechanical operations," referencing French Revolution timetables as the preliminary means of converting to the decimal system. [13] What once required personal mathematics could eventually be referenced on an existing code sheet, which transcribed conversions with alacrity. Ascribing a time code to every interlocking moving part was critical not only for managing the factory gestalt but also for imagining everything as an element of computation. The technique of taking systems apart and rationally organizing them part by part, piece by piece, moment by moment, established platform automation as a core logic of computational design.

From Chaplin to Durkheim to David Harvey, critics over the subsequent decades deconstructed the impact of the grueling requirements of assembly time on the humans who worked the line day in and out and the broader impact of Fordism on almost every aspect of modern society—from fatigue to economy to psyche. The critiques often conflate Taylorism and Fordism, with these philosophies' mutual emphasis on efficiency, timekeeping, and work that privileged the mechanical clock over care for the human subject. In fact, Ford was careful not to mention Frederick Taylor and saw him as more of a management charlatan than a smart organizational designer, notably commenting that Taylor was always refining processes that didn't need to be there in the first place.

Rather than focus on the assembly line only via its reductionism of subjects, we might also see this shift in human responsibility as a painful hurdle in externalizing labor, shifting from humans as independent workers to humans as reproducers of machine proliferation. "Humans became appendages," as McLuhan states, "the sex organs of the machine." [14] McLuhan follows Marx's fragment on machines here, which positioned the factory as a platform poised to liberate humans from its immediate demands via **machines that make machines** as much as a place for ongoing entrapment into the vicious cycle of production.

The insights cut another way—the best way to design a fully automated system is to act it out: to perform it, program it, plan it, and coordinate it in advance. In hindsight, the assembly line appears as a theater for rehearsing the next steps of automation, a mechanism of performing the future. Just as the horse had pulled the carriage, ultimately leading to mechanical horsepower, the workers on the Fordist assembly line were playing at being machines.

Automation as a Planetary Process

Buckminster Fuller was a champion of automation, and he lauded Ford as an artist and design visionary. This was partly due to Ford's focus on finding increasingly light and durable materials, but it was mostly due to his total reengineering of the production process and society alongside it, his demonstrated commitment to converting luxury to mass mobility, and the unfailing ambition and total systems purview of his vision. As Fuller wrote in *Critical Path*, "Through the invisible and ever-higher-performance-per-pound alloys and the invisible controls of ever-closer measuring of invisibly operating parts of the machinery, structure, and production tooling of his automobiles, Ford developed the use of moving assembly lines. He concerned himself directly as the prime designer not only of his end product—the automobile—but also of his evolving machinery and structural technology and all the other supporting activities of final pertinence to the success." [15]

In the chapter "Automation" in *Operating Manual for Spaceship Earth*, Fuller describes "comprehensively commanded automation" as a fundamental principle for a viable future Earth: "Automation displaces the automatons," Fuller claims, positioning automation as a foundational process of biological and technological evolution, a dynamic biotechnical process of encoding and embedding persistent decisions. [16]

Fuller's framing of automation presents it as an evolutionary dynamic, in which one

13. Babbage, *Economy of Machinery*, 125.
14. McLuhan, *Understanding Media*.
15. Buckminster Fuller and Kuromiya, *Critical Path*, 53–54.
16. Buckminster Fuller, *Operating Manual*.

broader platform unconscious

the psychoanalytic unconscious and automation share a lot of similar vibes. Think about the Freudian slip - the sudden surfacing of a repressed wish taking over human behavior with the force of reflexive automaticity. Or what about his theory of drives? And what about Lacan, with his algorithmization of psychoanalysis through the formulas of desire or the four discourses?

Evolution resolves decisions into automated forms

To say differently, evolution also evolves, it iterates and invents modes of information propagation on the go - just another strong correlation with The Extended Evolutionary Synthesis. In this sense, the emergence of technology in sapient primates may be seen as an invention of a new evolutionary armature, one that itself undergoes stages of evolution.

thing that was once open to decision resolves itself into a predetermined context, setting a particular path that in turn enables other emergent formations. Automation is a process by which decision-making occurs through inscription into devices or environments, causing further cascades. In this way, automation accounts for a deeper evolutionary logic whereby what once required explicit cognitive oversight or decision becomes embedded into infrastructures, becoming part of a general environment and integrating into a **broader platform unconscious**. [17] If automation is marked by the consolidation and congealing of a decision into a predetermined process, it is in fact an operational principle of incorporating feedback such that it is *driverless*.

In this sense, automation is highly contingent and path-dependent, as it entrenches platforms upon platforms. [18] Platforms establish a programmable and distributed mode of patterning intelligence, meaning that decisions can be encoded or embedded into the system. Automation is not something only assembly lines do but also something that ecosystems do, that cells do, that psyches do, that bodies do, and that planets do. **Evolution resolves decisions into automated forms**, discovering structural formations through encounters and tests in environments rather than programming these operations from first principles. In this sense, evolution itself is a process of automation, one that generates and builds on a persistent path so that a choice that once required conscious decision no longer requires that decision to be reviewed at a conscious level. [19]

Persistent Prospects

In the age of AI, this delegation of decisions from humans to machines operates less like programming and more like learning. Learning can be understood as a process of updating a model based on feedback, one that advances the foundational framework to build other things and decisions on. Under this guise, we can view infrastructure as an evolutionary demonstration of platform automation, the collective externalization and amplification of labor that shifts intrinsic functions to external, embedded ones. Platforms enable automation to coordinate across individual nodes in a network so they become interoperable and to transfer infrastructural knowledge from one domain to another.

Automation will continue to pervade the vast majority of spaces, from closed dark factories to urban landscapes humming with robotic agents, and now in more cognitive modes, from writing to editing to imagery. Just as censored doors, switchboard circuits, and automatic banking machines once revolutionized services, the next waves of automation will take both sensational and banal forms: horizontal escalators, mobile street sweepers, delivery bots, payment processing, and psychological soothing. In factories across Earth today, fenced-off robots and their limbs that pivot in every direction are already patiently enacting the procedure of precisely installing and bolting parts of the automobile along moving assemblies, one after the other after the other, a perfectly patterned production lullaby.

Automation once provided a distinguishing mirror of the incredible power of the general intellect and the breathtaking stupidity routinized by the inflexibility of systems incapable of parsing the exception from the rule. It was once thought that the banality of tasks absorbed by the increasingly interoperable machinery of production integrated via its decentralization would free the depths and dimensions of human curiosity and acuity. Today, as AI takes on both cognitive and physical dexterities once preserved for the human intellect, both language and hand are bending toward other, more evolved forms of automation that operate at scopes and scales impossible for human decision to apprehend or human labor to address.

AUTOMOBILES: FROM MACHINES TO ROBOTS

The age of automatons precedes the age of automation.
—Frederick Pollock, 1956

Extrinsic Platform Power

The broadest lineage of the automobile can be traced back to the cart, or a simple platform on wheels, but the first instance of the modern automobile is attributed to French inventor Nicolas-Joseph Cugnot who created a small, steam-powered cart in 1769. Unlike the carriage, pulled by a horse or a few horses, the auto-cart—which eventually became the motorcar—had the capacity for self-propulsion and contained its power-processing mechanism within its own bodily construction.

By the late nineteenth century, the term “automobile” had pervaded the common vernacular, referring to a variety of vehicles powered by steam, compressed air, or electric motors. Unlike the locomotive, which was constrained by tracks, the automobile implied autonomy from the restricted collective trajectory of the train, an individual directional independence that afforded a flexible accommodation to any sudden shift in destination. The engine of automotive production was propelled by the internal combustion engine. Ford’s Model T housed a “planetary” engine, a name that referred to the design structure of its rotation but also, more poetically, to its capacity for wandering. [20]

17. Buckminster Fuller, Operating Manual; Sherman, “Planetary Platform Automation,” 77.
18. Wimsatt, “Generative Entrenchment,” 224.
19. Wimsatt, Re-Engineering Philosophy, 356.
20. White, “Farewell My Lovely!”

The core paradox of the auto remained. While the automobile's power processor was carried on board, affording a certain degree of mobile independence, its energetic resource came from elsewhere. This was not a bicycle, which relied on a closed or contained power loop, requiring only the energetic momentum of its rider to propel itself forward. Instead, in its energetic contingencies, the automobile shares a close lineage with the automata that preceded it, and the long discussed uncanny vicissitudes of dependence and independence invited by these mechanical creatures that appear to move on their own.

Automata long influenced the human imagination through delight and disquiet, little test cases of "life" manifesting scientific invention and the fantasy of movement without human intervention. Independence was a delusion, a false boundary of the housing of the power-processing mechanism as the boundary for "self" containment. Early automata, from clocks to figurines, used hydraulics and pneumatics to regulate, harness, and modulate wind and water power, demonstrating cybernetic principles long before the term was coined and circulated. Descartes wrote poetically about Vaucanson's Mechanical Duck, and the Mechanical Turk and intricately engineered figurines of piano players, dancers, dolls, and other devices were fascinations of the early industrial age. The mechanisms of biological life came to be understood through the metaphor of the mechanical. "The development of automata made explicit an ever-unfolding series of correspondences between the body and the machine." [21] And, as Descartes put it, "The mechanisms of the body are the same as those of mechanical waterworks." [22]

These automata, while seemingly independent, all relied on power generated by external outside energies, kinetic power, or movement generated by concealed human puppetry. When the famous Mechanical Turk was displayed in 1793, Karl Gottlieb von Windisch wrote a pamphlet called *Inanimate Reason*, in which he discusses two deceptions of automata—"via motrix" (motive power) and "via directrix" (directive power) [23]. These dual deceptions described both the deceit by automata and the delusions of its observers, with the mechanism or motion converter contained inside reflecting a displacement from the actual (external) source of energetic power and a predetermined prescription in the direction or decision of automated movements. This deception of agential autonomy similarly reflects the deluded condition of humans, constrained by motive and directive both by resources and via intelligence.

Motive suggests purpose and direction suggests intent. Darwinism makes clear that evolution is more responsive to immediate conditions than to long-term plans, constraining motive. Jessica Riskin points out that self-volition is never truly independent but is always independent, contingent, and externally constructed. [24] The proclivity for mobility at the core of life, as that which moves and adapts and mutates, is traceable to cellular volition, planetary chemistry, or electric currents, whether via wind, bacteria, mitochondria, or DNA. Life itself is not typically a conscious choice or decision at the outset, and yet movement occurs through an action or drive, first toward survival but then in response to other factors, many of which remain undisclosed to the agent driven by drives.

Most decisions are determined not by conscious directive but by a *momentum* of life shaped by social forces unintelligible to the conscious mind and often without intelligent purpose. Freud famously disconnected drives from natural instincts, instead linking them to political and social libidinal constructs. Biologist and philosopher Étienne-Jules Marey reviewed the motility of everything that moved without intent at a microcosmic scale, defining complexity as a set of trajectories that rejected an overarching directive for grand systems, even when they culminated as such. [25] While humans were well understood to be governed by the automatic function of internal organs, directed, conscious volition was a rare exception.

In this sense, the force of life can be understood best as momentum rather than motive, a form of evolutionary automation whereby the continued persistence and perpetuation of processes is preordained. Via automobility, or the automaton that moves on its own, it was demonstrated that individual survival and continuity were markedly different from the directive or trajectory of a species at large. Thanks to the auto, any agent, following its own momentum, could unwittingly pursue a path counterproductive to its larger species.

Motion Pictures: Drive and Desires

Ford famously said, "You can have the Model T in any color as long as it's black," a public quip that generously pandered to his populist audience while reinforcing the values of utility. You could originally get the Model T in many colors, but the drying process was quicker with black, and so efficiency won over choice. You could, however, purchase the black Model T in many versions, such as the runabout, the touring, the roadster, the speedster, the touring car, the coupelet (an early convertible with a folding top), and the torpedo (a streamlined sporty edition). Fordist vertical integration meant that Ford had more and more machines that made machines. But the chassis, the foundational platform, was exactly the same in every single version.

However, engineering the production process of mass production was not enough; mass consumption had to be engineered as well. When Ford purportedly famously joked, "If I asked people what they wanted they would have said a faster horse,"

21. Riskin, *Restless Clock*, chap. 6.
22. Bates, *Artificial History*, 22.
23. Riskin, *Restless*, chap. 6.
24. Riskin, *Restless Clock*, chap. 8.
25. Marey, *Movement*, chap. 1.

the human body and the machine

The clutch pedal is the crucial interface in the mechanical intimacy between the human body and the car. Your leg becomes the carrier of motion that connects and disconnects the flow of power transmission between the engine and the wheels, thus reserving for the human driver the role of a governor in a cybernetic system. Automatic transmission gearbox - and hence the disappearance of the clutch pedal - is the crucial evolutionary juncture that propelled the car to its driverless future.

swarm of partially autonomous automata

The swarm paradigm links the evolution of the driverless automobile to the evolution of the autonomous LLM-based agents.

he was referring to the inability of the public to peer into the future but also to the required design of demand and desire. The low price was an important part of the equation, but social desire was not driven by price alone. It was no coincidence that the instantiation of the assembly line coincided with Ford Motion Pictures, the largest film company of any industrial producer at the time. Mass production was nothing without steady demand that perpetuated the continuous circulation of automobility machines. Ford's social platforms included profit-sharing schemes that made its workers owners, Ford newspapers that promoted Ford's populist perspectives, the Ford Motion Picture Unit proliferating newsreels that just happened to feature a jet-black Model T in the most contemporary sagas of the day, and Ford dealerships that created clear protocols for Fordist maintenance and distribution. Ford developed signature methods for naturalizing strange technologies, developing platforms for production and dissemination and automating the drive for the automobile.

Automata and Driver-Cars

Behind the wheel, humans merge with the car, becoming, as John Urry described, "a car-driver or a driver-car." [26] Extending the human frame, the autobody of the automobile merged **the human body and the machine**, inextricably intertwining the physical and the psychological. The automobile demonstrated an anti-Cartesian modality, in which cognition and coordination manifest in the rote and pleasurable operations of the drive.

With the fragile frame of the human body encased in glass and steel, augmented by the windshield and four wheels, the organization of mobility around the individual driver reinforced the delusion of individual automobility, of each human at the center of control of their own little universe and each automobile an island, protected privately from the greater world. By the simple pressure of a foot on the gas pedal, hands on the wheel, key in the lock, mirrors extending eyes in many directions, the gasoline motorcar became a prosthetic that supplanted other paths for the wheel or the pedestrian, which may have had more energetically sensible or rational means. There were other paths not taken, mostly due to capital and circumstance, from electric to bicycle power. [27] This role, this delusion of autonomy, was reinforced in reality and its myriad renderings, from sublime landscape scenes to movie screens traversed at unprecedented speeds.

There was always something larger than life about the automobile, something that animated it and gave it a personage, always seeming on the precipice of becoming sentient. In Ford's day, the Model T's were affectionately referred to as the Tin Lizzy, with songs and slogans devoted to the popular car that was durable and finicky at once, reliable but requiring special techniques acquired by its owner to maintain smooth functioning. This proclivity for animation, perhaps a function of the motive and directive delusions, has perpetuated car narratives ever since. In sci-fi writer Isaac Asimov's short story "Sally," the horror wish of automobiles deciding their own destination is depicted. [28] In *The Uncanny*, Freud describes the automaton as a figure of both familiarity and alienation. [29] The uncanny was a functional effect of life-likeness, of too-close-for-comfort proximity between human thing and inanimate thing that appears animate. Masahiro Mori used this term in relation to contemporary robots, describing an "uncanny valley" in which the more closely the mechanical thing resembles a biological living thing, the more threatening or disturbing it is to the living thing.

The emerging paradigm is something different. As the automobile shifts away from a machine that could be managed, memorized, and driven by humans, another philosophical paradigm is emerging, one in which the robot is not a single agent but part of a **swarm of partially autonomous automata**. But rather than total synchronicity from top-down control, the network of automobile automata maneuvers through a hybrid of centralized and decentralized interactions. It's not that the automobile mimics something recognizable, but that it hybridizes the cart and the horse, the phone, the computer. It is moving from machine to robot, a computer to ride in, a single instance of an entire mobile intelligence network traversing the city. The driver, with their delusions of destiny and destination, of control and power, is dead.

The automobile will be less a single robot with its own desires and determinations than part-ride, part-simulation, part-body, and part-computer. It is a node in a moving, distributed sensing apparatus that feeds and is fed by an endless stream of data. These data comprise the computer city, which is networked to the planetary processes of outputs and inputs. The cloud car is not a car at all, but rather a terminal, a port, a synapse, one form of an urban-scale sensing-machine learning megastucture. It processes data as much as it processes physical transit. [30] Rather than have a mind of its own, the automaton shares a body and a mind and is part of a mobile planetary appendage roving the Earth.

- 26. Urry, "System of Automobility."
- 27. Berk., "The Electric Vehicle Revolution" Re-counts the 200-Year History of Evs."
- 28. Assimov, "Sally."
- 29. Freud, *Uncanny*.
- 30. Bratton, *Stack*, 109–41.

AUTOMATIC: FROM MOTIVE TO MOMENTUM

The nervous system and the automatic machine are fundamentally alike in that they are devices which make decisions on the basis of decisions they made in the past.
—Norbert Wiener

Iterative Evolution and Function Formalization

Over the course of the twentieth century, cars became more and more auto-operative, slowly releasing the driver-operator from manual functions and integrating those functions and powers into the automobile itself. Power steering and windshield wipers were introduced before the twentieth century. Power locks appeared as early as 1914. Silent movie star Florence Lawrence invented brake lights to give the car indicative clarity to others on the road. Keyless entry, automatic lights, power seating, and turn signals slowly became ubiquitous. [31] Automatic shift was developed in 1949, followed by power windows that automatically raised when the car was turned off, automatic radio seek functions, automatic anti-lock brakes, and automatic temperature control, and then cruise control, voice activation, and comfort settings.

When introduced, these automatic functions weren't viewed as dangers or threats but rather as expanded easements that freed up physical and mental capacities for the driver, enabling them to directly program and customize the car in some cases and to not think about aspects of driving they once had to think about in others.

The lineage of automaticity in this evolution of the automobile points to how the vast majority of technological innovation is slowly iterative rather than radically inventive. Unlike most technical inventions mentioned above, some automated functions (such as safety belts, airbags, or the unsuccessful speed limiters) were hotly contested or debated before their integration and then taken as a given after the fact. What is not-yet-automatic often introduces existential concerns of excess or transgression but rapidly adjusts into normalization once it is automated.

Over the course of the automobile's life in the twentieth century, this type of technological innovation was often accompanied by a proactive narrative for a future that included governmental investment and infrastructure, a social vision that sought to align industry and progress. Today, the focus tends to be preventative and on potential risks and safety rather than social possibilities.

As making things automatic necessarily implies a slow shift in functions, it also inevitably implies trade-offs. The introduction of technologies often includes a nostalgic lament about de-skilling, with the tragic loss habitually overemphasized in comparison to social gain. For the driver-operator, this includes the **loss of general skills** and know-how about the automobile's operating systems, which also implies an inability to intervene if things break down or go off course. Originally, to own a car you had to be confident in your ability to repair it; but the expansion of the platform led to *network effects* that ensured that more and more people were confident buying their own, since more and more people had them. **Nonexperts became confident relying on other drivers or neighbors to lend a helping hand.** Driving enthusiasts often describe the pleasure of manual control over a stick shift, of the responsive sensation of feeling the road, manipulating the merged machine in response to speed and terrain. Meanwhile, everyday drivers might laud the freedoms of an automatic drive, which allows the hands to perform other functions than the mundane attention of driving. Today, almost no one actually knows how their own car works, leaving it to specialists and maintenance people to diagnose malfunctions and repair broken parts or improve technical performance. Driving will suffer the same fate. When the specific becomes automatic, other, more general forms of knowledge and activities become possible.

Automaticity means a loss of control of certain functions that might not be relevant to everyday functionality but crucial in an emergency. Whether we design for a highly functional operational system or anticipate systems to break down often determines the lens through which the evolutionary values of automaticity are understood and extolled.

Physics Precedes the Psyche

Automaticity does not only refer to the evolutionary embedding of technologies into environments but is also a framework for understanding the process of thinking and **conscious intelligence** in action and decision.

At the turn of the twentieth century, while the Fordian automobile was coming into focus, avant-garde artists contended with an expanding environment of machines. They leveraged emerging ideas about Freudian unconsciousness to probe the distinctions and tensions between automatic machines and the automatic practices of human beings. The Surrealists developed the technique of automatic writing to contend with the increasing absence of control in the world and the psyche. Automatic writing was a method for unearthing the flotsam and jetsam of rationality, a means of tapping into the elisions, spontaneity, and slippages that the human brain creates, surfacing a deeper logic of feeling regularly constrained or overwritten by an increasingly mechanical society and civilization. [32] Automatic writing would engineer chance operations and bring up sources beyond reason otherwise un-

31. Denso Technic, "Female Pioneers."

32. Baillehache, "Chance Operations," 38–43.

loss of general skills

Returning to the previous annotation about the clutch pedal: The automatic transmission brings a desensitization of the driver to the engine's dynamics, which can be seen as a veritable deskilling from the perspective of a romantic 20th century car driver. Yet was this skill ever useful outside of the driving context? Did this sensitivity represent a transferable skill?

Nonexperts became confident relying on other drivers or neighbors to lend a helping hand

Note that this is culturally variable: The part of deskilling is implied also by the absence of some phenomena on the road, which is the function of changing traffic infrastructure and regulatory environment. In Czechia, you still need to know as a driver what to do when you overtake a horse cart, or how to behave when you encounter a tram on the intersection. In China, you still learn basics of car repair, given that the village roads and vast swaths of the land may not always offer the necessary assistance. Peter Hessler's "Country Driving" is a nice testament to that.

conscious intelligence

Not accidentally, Valentino Braitenberg's "Vehicles" - a book about the emergent behaviour of simple wheeled robots - is subtitled "Experiments in Synthetic Psychology".

accounted for to confront the generative complexity in the mismatches between humans and modern machines.

Techniques like automatic writing tried to tap into practices of thinking without cognizance, drawing a distinction between the explicit cogito, or consciousness as understood and defined by philosophy, and the continuous stream of spontaneous thought and action shaped by fluidity and ceaselessness. Breton thought that through “automatic” writing the Surrealists would “find themselves in the unmeasurable region between the conscious and the unconscious.” [33] Automatic writing had the potential to not only bring expressive or latent desires or thoughts to the surface but also provide a means to channel and assemble forces from the environment or context.

Automatic writing as deployed by the Surrealists in relation to psychoanalytic inspiration gestures to a larger, irreconcilable tension in the premise of the automatic. On one hand, Freud maintained that seemingly chance events, slips of the tongue, and so forth are actually governed by psychic determinism. Nothing in the mind, Freud believed, is arbitrary or undetermined; everything can be interpreted as symbolically pointing to something else, which is always an expression of the fundamental drives of pleasure, sex, and death. On the other hand, the automatic was a means to celebrate randomness, the coincidental, and the circumstantial, freedom from the freedom of choice, a means to celebrate, harness, and elaborate on uncertainty.

The Surrealist intention was not to simply render the weird, the unpredictable, the unusual, the surpassed, or the repressed anew but to dislodge deeper orders enabled and repressed by social configurations so that new phenomena would emerge. But it was never quite clear whether the Surrealists were liberating *preexisting* organic forces from the mass modern overriding of the machine, channeling the desires repressed by the repetitive machinery of society, or whether automatic writing was *generating* new arrangements by applying a mechanistic approach to an organic process. While at the turn of the century most science was discovering the mechanical aspects of the organic, the Surrealists were resurrecting organicism through a machinic process and protocol. The machines generated new drives and unleashed ones previously held hostage by social norms.

In Italy, the Futurists were also thinking about chance encounters and emergence, but they did so vis-à-vis accelerations made possible by machines. Marinetti based the *Manifesto of Futurism* on a single incident—his loss of control behind the wheel of his Fiat in 1908, which spurned a romantic celebration of contingent forces left blithely up to coincidence. Marinetti describes how, while out for a drive, he was thwarted by “two cyclists disapproving of me and tottering in front of me like two persuasive but contradictory reasons.” [34] After swerving his vehicle off the road and emerging from a ditch, Marinetti lauds the near-death encounter of the accident as an exhalation of all possibilities of energy and momentum. The altercation propelled a romance with the future that argues for erasing the past, insisting that history is in the way of progress and that the obliteration of museums and libraries and relics is the only means to embrace and accelerate the full potential of technological progress. Marinetti was primed for such an argument, having been born and raised in Alexandria, the city well known for the great destruction of its trove.

Both the Surrealists and the Futurists responded to emerging modern technologies (the motorcar being one prominent preoccupation) by focusing on how the biological and cultural were getting recoded, reordered, and overwritten by the integration of the mechanical, not only in everyday life and action but also in the habits of mind. Both creative movements sought a psychological framework that was more proactive and constructive than the confines of psychoanalytic practice and to harness the forces at play through power and performance. Many of their experiments aimed to understand the impossibility of a system or technology to be determined or controlled at the individual level, and the political or social incapacity to determine or control its tremendous influence. In this sense, the psychodynamic disquietude of the automatic can be framed in **two directions**, sometimes antithetical and other times complementary. The first, a *tendency and fear of independent conscious awareness by a machine (in which the machine imitates the human with too much fidelity and inhabits a delusory autonomy ascribed to humans)*. The second, a *lack of consciousness expression by a human (in which the human is reductively reduced to imitating the machine)*.

In 1927, Freud argued that most psychoanalysis lacked a drive theory. He described personality systematics in psychology as a form of paranoia and instead classified drives (the constructs of motivation and instincts) through dichotomies of Eros (life) and Thanatos (death) and sexual/ego drives as underpinning most action. The Freudian approach focused on undisclosed, hidden motives as the underlying rationale for actions. This presumed that a key diagnostic for understanding life itself was reasoning, as a form of freedom or agency in a regime of the unconscious. Freud argued that probing personal conduits would reveal some suppressed or repressed directives shaped by the drives that uncovered a deeper truth, an underlying motive. But the discipline of psychoanalysis overall overlooked another form of the unconscious. This unconscious need not be relegated to the symbolic familial analyses of Freud or the observational reductions of Jung’s collective archetypes. It can also be understood as far more behaviorist **and materialist**, an unconscious composed, embedded, and distributed in environments.

33. Breton et al., *Automatic Message*, 105.

34. Marinetti, *Manifesto of Futurism*, 19.

two directions

The third option would be to think with the Japanese history of robotics, that begins in the figure of Gakutensoku, a robot designed to embody the best of humankind - the curiosity and strife for wisdom. Here, the automation is neither traumatic mimicry, nor relegation of the human to the machinic realm, but a productive transcendence towards super-human or more-than-human.

and materialist

J.G. Ballard’s fiction is filled with the idea that we must turn psychoanalysis outward, rather than just inward, so as to diagnose the perversions and manias of our built environment. Arguably, something similar goes back to the very origins of the concept of the unconscious (“Unbewusstsein”) in German Idealism: which, conceiving of everything as mind, could only incorporate the prehuman aeons of geology as a form of preconscious prelude to spirit. In other words, matter is just the portion of spirit that hasn’t become fully conscious yet and, thus, the entire inorganic world becomes one vast unconscious.

This is because environments condition behavior but also because the material conditions of proxemics, artifacts, infrastructures, and technologies are literally embedded in and distributed throughout the environment. Environments not only reflect sociotechnical ideologies but also recursively produce and perpetuate them. The unconscious is not psychic material but embedded material, a set of shared constraints and opportunities distributed throughout infrastructures, which reflect the collective aspirations, accidents and oversights, and technologies at a given time. That given time is always cascading into other times that elude it and are contingent on it, causing a rift between infrastructural time and cognitive time.

Thus, rather than construe the unconscious as a collective problem of *motive*, it might be better understood as a function of *momentum*. In this sense, the unconscious can perhaps be seen in a more fundamental way than via cognitive repression: it holds the fragments of society that have yet to be rationalized. Automotive infrastructure functions in this way, touching on Eros and Thanatos precisely because it does not resolve the rationality behind such a resource-irrational system. Rather, it perpetuates—via momentum—that irrationality, eventually invoking a platform rupture predicated on the incommensurability of the ideology embedded in the environment throughout. Psychosis can be understood not as an internal phenomenon but rather an expression of an unreconciled social incongruity, a reflection of the confluence of the rationality and irrationality of the systems it must inhabit.

The Platform Unconscious

One of the larger missions of cyberneticist Gregory Bateson was to overcome the limited frames of cognition and psychoanalysis and the requirements to fully distinguish each as either self- or socially determined. Bateson was concerned with how environments and ecologies determine the relationship between mind and material forms. His research sought to solve the conundrum of automatic awareness and the relationship between consciousness and residual formation for human knowledge and recall. Describing the simple act of navigating home on a familiar road, Bateson clarifies that automaticity operates in the subconscious dimension, challenging epistemological orientation as the fundamental determinant of thought or action. “‘I know the way to Cambridge,’ might mean that I have studied the map and can give you directions. It might mean that I can recall details all along the route, it might mean that when driving that route I recognize many details even though I could recall only a few. It might mean that when driving to Cambridge I can trust ‘habit’ to make me turn on the right points, without having to think where I am going.” [35] The better an organism “knows” something, Bateson reminds us, the less conscious it becomes of its knowledge. In this sense, automaticity is not a disguise for a mechanical takeover but an expression of the deepest absorption of decision into the logic of behavior. What was once part of mind becomes an embodied principle, a distributed **cognitive act**.

Mobility exposes the automatic functions of the body as that which frees the mind toward higher-order thoughts. It is critically *not* a wholly immobile body that enables such thinking (as the case of AV drivers will make clear) but one mobilized just enough in routine action and concentration of another kind such that higher-order thinking can emerge.

The nervous system offers an apt framework for understanding the transition and evolution of automation from automatic as a *reflexive* capacity to an *autonomic* system that unconsciously regulates flows to maintain smooth functioning. The autonomic nervous system regulates *involuntary* physiologic processes, including heart rate, blinking, swallowing, blood pressure, respiration, digestion, and sexual arousal. These systems, both conditioned and learned, contain distinct divisions with the capacity to regulate themselves quasi-independently. Interestingly, the involuntary aspects of the system are preventative against self-destruction. You can’t hold your breath until you die (the reflex overrides the brain’s attempt to do so), but you *can* drive off a cliff.

Many scholars have understood the automatic to be not only a cognitive process but also a process that becomes realized via **externalized action**. Thought is produced in a reflective reaction to the world, not as a primary lens. One doesn’t quite know what one will say before it is said—thinking moves at the speed of speaking or writing, comes to be vis-à-vis the mechanics of motion. As Benjamin Libet’s neuroscientific experiment found, “cerebral initiation of a spontaneous, freely voluntary act can begin unconsciously, that is, before there is any (at least recallable) subjective awareness that a ‘decision’ to act has already been initiated cerebrally. This introduces certain constraints on the potentiality for conscious initiation and control of voluntary acts.” [36] Or, as Janet diagnoses:

The term automatic refers to a movement with two characteristics. First, it should have something spontaneous about it, at least in appearance, having its source in the object itself, which moves itself and does not need an impulse from without. A mechanical doll that walks by itself would be called an automaton, a pump which one operates from the outside would not be. Next, it is necessary that the movement remain very regular, operating under a rigorous determinism, without variations or caprice. Now, the principal extensions of human activity possess precisely these two characteristics: they are induced and are not created by outside force, they originate from the subjects

35. Bateson, *Ecology of Mind*, 143.

36. Libet et al., “Time of Conscious Intention.”

cognitive act

Again, for precursor, see S. Butler, *Life & Mind* (London, 1878)

externalized action

A lot of athletic training is just about this - the gradual sedimentation of the movement into the body’s unconscious, the augmentation via reduction in conscious effort. Think muscle memory, hundreds of reps that perfect your fitness movements, the conditioning of the body to specific actions such as kicks or throws.

the highest form

The neurophilosopher Thomas Metzinger makes a similar point, calling self-consciousness “a special form of darkness”. Our selves appear as immediate, tangible, and inviolable realities to us, precisely because the earlier stages of cognition — those which construct that sense of selfhood from impersonal inputs — are hidden from us and, thus, are unconscious. If we could represent to ourselves the fact we are representations — thus illuminating all the upstream workings of the system — this sense of the self’s irreducibility would evaporate. Interestingly, Metzinger also highlights what he calls ‘M-autonomy’, or our capacity to intervene in our own thought-processes, before demonstrating how little time we actually spend being mentally-autonomous in this way. See T. Metzinger, ‘M-Autonomy’, *Journal of Consciousness Studies*, 22 (2015), pp.270-302.

Momentum rather than motive

Spinoza - the greatest determinist of modern Western philosophy - calls this conatus: a psychological or physical impetus or inclination to perpetuate or modify an action.

pleasure from terror

Already in 1757, Edmund Burke was diagnosing what he called “pleasurable fear”: or, the delight we get from experiencing terror at a safe enough distance. See E. Burke, *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime & Beautiful* (London, 1757).

themselves and yet they are so regular that there can be no question of free will, which higher faculties require. But there is also another meaning we often apply to the word automatic, one not so easily accepted. For some authors an automatic activity is not only regular and rigorously determined, but also one that is purely mechanical, without consciousness. [37]

Rather than view the unconscious or involuntary as a lesser form of conscious thought, or as an unreconciled miasma, we can also view autonomic as **the highest form** of functioning intelligence, as a stage or step beyond cognition or voluntary action. [38] In this sense, a set of functions have been absorbed into the environment (in this case the body) as a system, making space for other functions and occupations to be pursued by the brain. We can see this in the way that a virtuoso violin player no longer needs to consciously consider the string of each note they play; they know the instrument, as we say, by heart. Perhaps even more accurately, it is their hands that automatically “know” correspondences between sound and the action of pressing such and such strings. The autonomic wisdom is embedded and distributed in the environment rather than regulated by the central authority of the brain, which frees up brain capacity for other imperative processes.

Already within the automobile, the vast majority of mechanisms are involuntary to the vehicle’s operator. The governor of the internal combustion engine was a regulatory device from the outset. Today, various lights and indicators on the dashboard provide a signal (but not always a specific diagnostic) when one of the autonomic systems is not working as planned. This indicator is only activated when the self-regulating system cannot automatically solve the problem. Automatic systems present themselves upon breakdown, when variations or system exceptions that cannot be diagnosed or mitigated as part of the self-regulating activities emerge.

It’s likely that the modern investigation of the cognitive unconscious as the locus of the automatic is similarly a red herring. Most modern and postmodern paradigms, with their emphasis on auto-interpretation and constructed meaning-making, distracted from the insights of the systems perspective, which included how a wider environment and ecosystemic complexity beyond the agent shape and constrain behavior, action, or performance itself. The drive of any thing is better modeled after the autonomic than after the automatic, attributable to forces from momentum (the amount of speed it has as a result of its mass) and inertia (its resistance to change) rather than motive as a function of suppressed wishes or natural instincts.

A thing, a system, operates by its own volition, but it is enabled and sustained by its surrounding environment and moves through the slipshod confrontations with it in all of the latter’s untimeliness in reaction, malleability, and adaptation. Rather than some sublimated reason, it finds perpetuity and continuous change as a function of complexity and a descriptor of reason rather than its inverse.

Momentum rather than motive is the determining logic for the influence of the automatic on platform automation.

Pleasures: Transportation Without Destination

As Fordist mass production occupied more and more of the collective psyche after 1914, and as the automobile occupied more and more land with roads where forests once were, modernity outlined more rigid distinctions between the workweek and the weekend (and times for pleasure). One key space for artificial pleasure was the amusement park, a typology of space that morphed from pleasure gardens—artificial contexts of natural wilderness—toward the presentation of mobility in artificial and constrained form. Notably, these spaces marked an inversion from the typical delivery of capital production. A pedestrian land, closed off from the traffic and mercantilism of everyday society, invited the body to drop itself off onto an auto-motive motion.

If on the assembly line people played at being machines for work, the ride subjects the body to machine momentum and unfamiliar speeds, translating the physical experience of the physics of machines in motion to the human frame. In a society driven by automobilic momentum, “rides” offer transportation without destination. They place the body in the position of the mechanism, a means for testing and pushing it as an object, submerging thought to alien sensation. The point is to temporarily push the body to its full automaticity as the maximum mode of pleasure, which often contains a fair bit of fear or even terror, fooling the body and tricking the mind through an experience **that overrides its rational mode**. Thrill rides encourage modern subjects to take **pleasure from terror**, the existential encounter with their own mortality presented at unprecedented speeds in the new mobility machines.

As automobiles become increasingly automated, human drivers will become an anomaly and eventually a menace to a system coordinated by the reliability and regularity of connected real-time processing. Distractible humans, whose attention in a split second might submit to the other interesting humans in their local and personal virtual interfaces, will increasingly require driving to be something of an exception rather than a rule. The most dangerous combination will be the integration of humans and computer drivers, as old habits can prevent new technologies from taking hold. Driving will not be fully extinct, but it will be an exception rather than the rule, relegated to play or game contexts instead of exclusively performing

37. Janet, *Psychological Automatism*, 1:1.

38. Bargh and Morsella, “Unconscious Mind.”

Formula 1

As a F1 fan, this made me immediately think of Lewis Hamilton, who confessed once that he hates driving in normal traffic (implying that he does not enjoy being distracted by all the traffic signs and rules and other cars and so on). Perhaps the most skilled drivers in the world should be the intellectual avant-garde of the driving's automation. Every aspiring driver should get a chance to experience the pristine, almost Platonic form of driving, such as piloting a formula. As a psychotherapeutic exercise, it may lead people to give up the urge to use normal traffic as a proving ground of one's individual mastery.

transforms earth itself

Such ideas have a longer pedigree, but reach a state of explicitness in Ernst Kapp's *Grundlinien einer Philosophie der Technik* (Braunschweig, 1877). Therein, Kapp argued that technologies are a form of prosthesis or "organ projection": wherein, we outsource or delegate what was once the function of an organ or appendage to external, mechanical means. A lever is an arm, a telegraph network is a nervous system, and so forth.

possibly over-ascribed this

Ironical that the very year before Papanek made these comments, James Lovelock unleashed his Gaia theory on the world. Lovelock's theory argues, essentially, that life — en masse — possesses such alloplastic mastery, or, ability to keep its environmental conditions from drifting outside parameters that are conducive to its own flourishing. This is an alluring synchronicity. See J. Lovelock, 'Gaia as seen through the atmosphere', *Atmospheric Environment* 6:8 (1972), pp.579-580.

the functions of work. Driving by human operators will likely be preserved for places off-grid. Phenomena such as **Formula 1** already push these forms of extreme driving to their limits. Proving grounds that once served as test sites for new vehicles may become future driving parks, fenced off amusement areas where, like at arcades or race-car tracks, humans are able to operate machinery in a protected zone.

Meanwhile, in virtual contexts, the arcade that once provided the means for humans to drive and maneuver at speeds impossible in real life, allowing them to crash without consequence, plays an increasing role in shaping reality itself. Today, gaming environments provide the training grounds for AVs to ceaselessly learn the parameters of the road, without too many delineations between the interactions in the game world and those in real life. These simulations of the Autocene run continuously with AI models driving round the clock to train their self-driving counterparts. Meanwhile, virtual drivers operating multiple vehicles remotely learn how to overcome unanticipated street snags, feeding data into the planetary model of mobility machines.

AUTOPOIESIS: FROM ADAPTATIVE REPRODUCTION TO ARTIFICIAL EVOLUTION

Machines which reproduce machinery do not reproduce machines after their own kind.
—Samuel Butler, *Erewhon*

Self-Reproduction

The pivotal 1972 book *Autopoiesis and Cognition: The Realization of the Living* by Chilean biologists Humberto Maturana and Francisco Varela initiated an almost fetishistic obsession with the term "autopoiesis," which it coined. [39] The term advanced internal system reproduction to structural distinction—the capacity and trajectory for development, growth, maintenance, and evolution produced from *within* the system itself. Autopoiesis refers to the self-generating, self-governing, self-deciding, self-perpetuating, and self-reproducing dimensions of living systems. Its efficiencies are achieved by an enclosed topology whose complexity arises from its internal process of protecting itself from, adapting to, and navigating among its larger environment, rather than seeking codependencies with it.

Autopoiesis as a concept set in motion a cascade of thinking on the topic that extended far beyond the biological realm in which it emerged. Cybernetician Stafford Beer developed viable systems theory (VSR), porting the theory of autopoiesis into social organizations and governance institutions and positing a method for designing systems with autopoietic capacity. Economist Friedrich Hayek, responsible for the invention of neoliberal free markets, interpreted this ideology of feedback in the other direction, focusing on the distributed potential of information systems rather than their holistic consolidation and demonstrating that economic markets are exactly these "self-organizing or self-generating systems" that, based on thousands of decentralized signals, can automatically respond to variations and fluctuations. The Hayekian view posits that all outside coordination would interfere with the process whereby the organization of any living thing determines its subsequent decisions, limiting its possible variations such that it is determined by the very constraints that perpetuate it. Autopoiesis was a celebrated solution for understanding the perpetuation of any entity on its own terms. Rather than Cartesian essence, which had for so long provided the means for a philosophy of the self, or submitting the self to higher order planning, autopoiesis saw the self's primary function as perpetuating its own insular process of decision-making and reproductive organization.

This obsession with autopoiesis may be one possible diagnostic for understanding why design, along with the history of technology, has so fetishistically focused on devices rather than environments. The obsession with how an individual thing grows in spite of the conditions that surround it reflects a confusion and obfuscation in the trajectory of externalization, exacerbated by the Western political context, wherein freedom and choice have been championed above social order or collective prowess. Humans have always been extending beyond the unique capacities endowed to them—toolmaking has itself been this process of transformation, which in turn transforms human dependency and capacity. Infrastructure extends tools to collective operation. It is not just internal reproduction; it is augmentation, enhancement, and manipulation.

As Victor Papanek describes, "Mankind is unique amongst the animals in relationship to his environment. All other animals adapt *autoplastically* to a changing environment (by growing thicker fur for the winter or evolving into a totally new species over a half million year cycle); only mankind **transforms earth itself** to suit its needs and wants *alloplastically*. This job of form giving and reshaping has become the designers' responsibility." [40] Thus, according to Papanek, a designer manages this externalization, giving it form. This formation, developed to suit humankind's needs, also has the challenge of scale, given that the pursuit of its needs in spite of its constraints might allocentrically undermine its ultimate aspiration for auto-perpetuation. Papanek **possibly over-ascribed** this functionality to humans, as beavers and other animals—and potentially artificially intelligent beings such as robots—also exhibit this proclivity to design environments. Understanding the device or tool as an extension or self-reproduction is a rudimentary form of autopoiesis, one that

39. Maturana and Varela, *Autopoiesis and Cognition: The Realization of the Living*.

40. Papanek, *Design for the Real World*, 184.

should not be limited to agents or to self-contained worlds but that might, through its allopoietic externalization, navigate complexity unbeknownst to the purview of intelligent agents limited by their own experience.

Path-Dependence and Infrastructural Acquiescence

John Urry describes the automotive system as having developed through an “auto-poietic” process, pointing to how the automobile perpetuated itself via a self-generating logic of infrastructure that typically developed street by street and road by road, rather than via a comprehensive or coordinated plan. The autopoietic automobile slowly infiltrated all levels of society as a general design principle, from personal mobility to governance. It championed the individual agent and fostered the slow detachment of its responsibility from its collective contingencies and social contingency from energy, economy, access, and spatial consolidation.

The automobile became not only an instantiation of a philosophy but also a metaphor for independence from systems infrastructures and unpredictable contingencies, a heuristic for avoiding the top-down, hierarchical systems that seemed too prescriptive, fixed, and top-weighted. Ironically, the road system in the United States marched forward thanks to state support for highways during the Great Depression, intended to catalyze the American automotive market and advanced real estate speculations on property values alongside highways that would never come to fruition. Autopoietics promoted a decentralized order that harnessed the individual trajectory as the de facto determining principle.

One problem with autopoiesis is in principle the same problem as that of natural evolution. A reproducing thing uses *itself* as a model for successful performance. It does not take into account a grand plan of time or space, it does not account for the big picture, it cannot model multiple contingencies, and it does not plan for possible cascades or secondary effects. This is exactly how, bit by bit, road by road, autopoiesis and self-reproduction ended up with the catastrophe of the road system, the miasma of highways that has concretized the planet.

Part of what makes an autopoietic organization successful is that it is based on submission. In the case of the automobile, this can be understood as a submission to the flow and trajectory of the system itself, what Reyner Banham describes in relation to the Los Angeles freeway as “acquiescence”:

The watchful tolerance and almost impeccable lane discipline of Angeleno drivers on the freeways is often noted, but not the fact that both are symptoms of something deeper—willing acquiescence in an incredibly demanding man/machine system. The fact that no single ordinance, specification, or instruction manual describes the system in its totality does not make it any less complete or all embracing—or any less demanding. It demands, first of all, an open but decisive attitude to the placing of the car on the road-surface, a constant stream of decisions that it would be fashionable to describe as “existential” or even “situational,” but would be better to regard simply as a higher form of pragmatism. [41]

Banham celebrates a disorderly open road that functions by principle rather than prescription. Collective momentum culminates in the autopoiesis of speed. He continues:

It seems possible that, given a body of drivers already so well trained, disciplined, and conditioned, realistic cost-benefit analysis might show that the marginal gains in efficiency through automation might be offset by the psychological deprivations caused by destroying the residual illusions of free decision and driving skill surviving in the present situation. However inefficiently organized, the million or so human minds at large on the freeway system at any time comprise a far greater computing capacity than could be built into any machine currently conceivable—why not put that capacity to work by fostering the illusion that it is in charge of the situation? [42]

It is here that Banham says explicitly what most contemporary critics of automation leave out. It is not the quantitative loss of jobs that might produce such a loss in the process of automation, it is that the marginal gains might not compensate for the psychological consequences of the sense of losing control for the human species, however delusory. The illusion of freedom, just like the illusion of control or the illusion of contribution to satisfy the fulfillment of labor, sustains the computational capacity of the brain; a systems conversion would need to compensate for the surplus reaction in the mind to the submission of control. The delusions of autopoiesis enable the continuity and fleeting satisfaction of a flow state.

Closed Systems and Permeable Boundaries

Systems theorist Niklas Luhmann describes autopoiesis as the process whereby a system reproduces elements previously filtered from an overly complex environment to propel and advance itself. Because systems perpetuate via communication, Luhmann argues, processes and networks produce and reproduce themselves and are required only to service the specific functions of intelligibility within their intended orbit. Via recursive communications, systems information reaches addressees and gains acceptance. In this way, systems operate as a program that

41. Banham, Los Angeles, 202.

42. Banham, 202.

filters and processes information from the environment in relation to preconceived scripts about that environment.

Luhmann describes all systems as operationally closed: they continually construct themselves and their perspective of reality, maintaining the distinction between system and environment while reproducing themselves as products of their own elements. Autoreferential systems are continuously confronted with the dilemma of disintegration and continuation. Hence, they incorporate and reinforce their own paths and persistence via relative and uncomprehensive circulation. This generates and perpetuates a paradox—"the relation between system and environment"—in which a system that produces information is operationally closed. "A system has to presuppose itself when it generates and processes information. It must already have limited the arbitrariness of possible surprises, and it must have redundancies at its disposal if it is to obtain information and process it within a limited time span. It has to be able to expect, typify, or guess what could be involved. This applies for perception and for elaborated communication." [43]

The implications are that any system (architectures, cities, disciplines, etc.) operates within its own enclosures, whether explicit or projected, which evermore entrench their own presumptions and projections within their manifest material realities. All is action, and action—or praxis—is communication.

This implies that action may or may not pertain directly to decision, because a decision may already have been programmed or become routine. According to Luhmann, forgetting is functional, since all that is communicated is the action of the decision itself. Any decision thereby incorporates and reinforces that action while leaving behind the functional memory of the other possibilities and peripheral factors in that decision. This implies that decisions, as they continue to occur iteratively and based on precedent, might not be attributed to an agent or ascribed to some deeper motive that could be understood to drive a particular decision. While often defined as freedom of choice, the internal decision process of a system is autopoietically contingent, based on how and when one decides to draw the boundaries of the agent in terms of its capacity for autonomous reproduction.

Stiegler traces the idea of self-reproduction to the theory of motion in Aristotle's *Physics*, noting that nothing truly has in itself the source of its own production. In this sense, technics is not autonomous but interdependent and contingent. [44] "An autopoietic system is to be contrasted with an allopoietic system, such as a car factory, which uses raw materials (components) to generate a car (an organized structure) which is something *other* than itself (the factory). However, if the system is extended from the factory to include components in the factory's 'environment,' such as supply chains, plant/equipment, workers, dealerships, customers, contracts, competitors, cars, spare parts, and so on, then as a total viable system it could be considered to be autopoietic." [45]

One only needs to look at the **asphaltification** of the earthly terrain to see the outcome of unplanned, unalloyed auto-reproduction. Evolution is an incredibly economically and energetically low-impact system, but small steps that seem intelligent in the small scope of the process emerge as completely inappropriate solutions in sum. Like an automobile, autopoietic evolutionary systems reproduce according to responses to local conditioning, modeling themselves after immediate precedent. They cannot account for larger trends, trajectories, or speculations; they are resigned to the precedent of niche-driven programming.

The problem is the distinction between intelligent agents and intelligent systems, or societies of agents able to coordinate or act in concert. In swarm intelligence, each agent plays a part in a distributed whole, confronting environmental pressures via collective maneuvering. This is quite different from autopoietic development, where each agent drives an agenda that does not, and does not need to, account for the whole trajectory of others: it just needs to modulate against or benefit from direct encounters.

Platforms accelerate autopoietic principles, advancing automation by allowing local coordination to ignore whole-systems development. To overcome the limitations of the auto, platform automation must shift drives from agent-based survival and reproduction toward an environmental orchestration of continuous calibration, which requires tremendous communication and coherence. This would not mean a self-reproducing *agent* but a self-sustaining *environment*. In this environment, the metabolic arrangement of inputs and outputs autoregulates, automatically knowing when the challenge ahead exceeds the capacity within and having the capacity to act on this knowing according to a broader set of intelligences gained from sources other than its own intrinsic reproduction.

43. Luhmann, *Autopoietic System*, 37.
44. Stiegler, *Technics and Time*, 3, 215.
45. Koskinen, *Knowledge Production*, 13.

asphaltification

Asphaltification testifies to the reading of auto's evolution as niche construction: the species (car) brings a baggage of its environment wherever it goes (asphalt road).

go to the beach instead

Or one that keeps you awake at night because it is upset by having to share the parking lot with other cars:

<https://www.youtube.com/watch?v=Xvs0K1LG1ac>

environmental constraints

Beyond that, this aspect also clarifies how rules to be automated have to be always interpreted in their context. The optimal performance - and indeed the very definition of what is to be performed - is contingent on the ecology, as pointed out by Gerd Gigerenzer or Herbert Simon.

Cognition in the wild

Again: "Cognition in the wild" alludes to Herbert Simon's bounded rationality.

AUTONOMOUSNESS: FROM CONTROL TO CONTINGENCY

A truly autonomous car would be one where you request it to take you to work and it decides to **go to the beach instead**.

— Nissan Engineer

Presumed Autonomously

The earliest provenance of AVs can be traced to a little cart designed by Leonardo da Vinci. The cart consisted of a platform on wheels powered by two symmetric springs that were calibrated by the same sort of balance wheel commonly used in clocks. The cart also had a little fork attached to an arm that extended past its front base, a sensor that indicated when to turn. The little mobile automaton entertained spectators by seemingly autonomously navigating a predetermined path through Florence's streets, following a series of well-positioned stakes indicating turning points throughout the city.

Like most automata, Da Vinci's cart was *preprogrammed* to perform sequences of operations without human intervention. But it wasn't the route itself that was programmed, but the reflexive and responsive behavior of the cart, based on interactions with the environment. Telling the car how to operate was not about operating the vehicle but about enabling the propulsive power mechanism by placing sensing devices on the agent and indicators in the environment. The vehicle's mechanism was instructed to recognize these indicators with a specified routine response to determine its navigation.

The most notable aspect of the story is that Florence's streets were one-way, making it easy for the cart to follow motion and avoid crashes. If this was indeed the first AV, as is often indicated, it follows that autonomousness not only refers to a device operated without external control but also implies the ways that that autonomous agent is able to leverage or resist **environmental constraints**.

This primal scene of self-driving plucked from the Renaissance indicates the ongoing tension between the design of control within the device and the design of control over the environment itself, demarcating a 500-year confusion over the focused calibration of such effects that continues today. Autonomous cars have been described by some as the ultimate "AI" problem—indeed, the challenge is not only pattern detection and decision in a computerized brain but also that the autonomous car is a physicalized exoskeleton, an embodied computer that humans ride in, bringing questions of safety, interaction with the environment, and security to the fore. **Cognition in the wild** forces the question of constraint as a factor of autonomousness.

The Autonomous Platform Stack

The successful acceleration of the automotive system required the convergence of a tremendous number of systems—the various systems of the vehicle itself, manufacture and assembly and distribution, fuel infrastructure, road infrastructure, supply chains, regulations and governance, traffic management, insurance and financing, education and training, etc.—and schematized production schematized it. Today, autonomous cars are increasingly possible thanks to a similar convergence of computational capacity—sensors and high-fidelity scanners, data processing, GPS, 5G connectivity, lidar and radar, object detection, classification and tracking, planning and decision-making, longitudinal and lateral control, etc. This autonomous automobility stack itself pressurizes and responds to the larger automobility ecosystem. It is fraught with the promise of driverless vehicles and concerns over data governance, power, security, and liability. Each item's shape also has implications for interoperability (of hardware and software between tech systems), for multiplicities (or the various ways in which a single data point may be used), for modularity (which changes the logics of the production line), for the evolution of machine vision and its evaluations of trust, and for the regulatory environment for testing, deployment, and international exchange. Each of these specific technologies inhabits a domain that has implications that stretch far beyond a single automotive machine. The successful or stunted development of these various elements has far more to do with shifts across the platform automobility stack than with agent-level decisions.

Always-Incomplete Autonomousness

In 2014, the Society of Automotive Engineers developed a standardized framework for comparing levels of vehicle automation. The six levels of automation provide a useful heuristic for understanding automation more broadly, an epistemological and ontological philosophy of machine operation and interaction. [46] At Level 0, there is a human driver with no automation. At Level 1, the machine provides driver assistance (like adaptive cruise control). At Level 2, there is partial automation (the car can steer, accelerate, break in some circumstances). At Level 3, there is conditional automation (the car can navigate most of the environment, but the driver supervises). At Level 4, there is high automation (the car can navigate some geographic circumstances without driver input or oversight). At Level 5, there is full automation (the car can navigate all circumstances better than a human driver). Each of these levels describes an integration that is partially subjective, partially contingent, and discretionary.

platform logic

In the context of Tesla's platform logic, it may be interesting to think about the competitive advantage of Chinese car makers, who can enjoy navigating a regulatory environment that is capable of rapid, large-scale deployment of systemic changes from above. The autonomous car infrastructure requires a compatible governance (infra)structure in which it is supposed to sit, and so the pivot towards autonomous cars is easier to be done in regulatory contexts pre-set to facilitate such pivots.

At the time of their creation, the levels fueled a hype cycle in which various companies claimed that the next level was right around the corner. As 2020 approached, each news cycle featured another major car supplier insisting that it would be the first to fully realize AVs. After mostly minor altercations that destabilized public faith and easy confidence in the dream that driverless vehicles would happen overnight, this hype eventually faded into a crescendo of competition for the impossible dream of integrating all the phenomena required to safely enable autonomousness. Recent rollouts have been more moderately publicized, since the public is by now fairly acclimated to the eventuality of automobiles operating themselves. Sooner or later, any hype wears down into a new normal.

For scientific research, the levels of autonomousness sometimes aided and other times confounded the conversation around AV development, providing a regulatory framework for technical and policy response while often distracting researchers with the goal of designation levels rather than focusing on the nuances of the specific issues at play. Designating the levels of independence diverted researchers from the more difficult and prescient questions about the fundamental interdependence between drivers, riders, and environments, an issue that is more about interaction, feedback, and governance dynamics in automated programming than about approaching automation and its total achievements as a discrete matter of fact.

Rather than realizing full automation through the cautionary world of perfecting things in simulation environments, Tesla, taking many insights from the Ford playbook, has gained market control by testing driving in the wild, infiltrating the ecosystem rather than beginning with a grand systems overhaul. Tesla launched with a luxury EV, then offering a cheaper and cheaper consumer vehicle. In early 2025, Tesla announced a pivot from planning an even cheaper consumer vehicle to an all-out robotaxi platform, sidestepping ownership challenges in favor of subscriptions that invite current owners to become platform shareholders. This pivot builds on Tesla's fundamental **platform logic**, with the car increasingly a computer on wheels, requiring updates and maintenance to its software and hardware and now matched by a distributed platform focused on users rather than drivers. Certain ideas—such as a real prototype tunnel that looks just like a train subway built exclusively for Tesla cars—make it clear that artificial stupidity can be just as easily programmed and developed as artificial intelligence, entrenching our biases (in terms of not only the racial ones everyone seems to be exclusively concerned with but also our ideological instincts of finding and creating patterns overall).

The platformization of intelligent automation implies that the thing formally understood to be “a” car is not actually a robot independent of all other robots moving around the city. The car is a platform node in a much broader integrated platform of cars, part of the city platform in which transport is an integrated function. Sam Hind describes the car as a media machine, presenting an alternative platform stack of automobility that might include the following dimensions: (1) the (hardware) “skateboard” platform; (2) the (mobile) sensing platform; (3) the (modular) app/product development platform; (4) the (developmental) partnership platform, which includes corporate connectors; (5) the (connective) platform ecosystem, which includes all IoT and other software infrastructures; and (6) the (embedded) urban platform. [47] The ever-increasing convergence, layering, and interoperability between the computational platforms that govern urban agents and urban infrastructure form an urban platform stack, in which the transport layer composes an automobility network that services movement at large.

Through this process, the automobile becomes a sensing platform, a delivery platform, a moving sensor that not only senses for its own navigation but can also feed sensing for other platforms into a vast network. This means that the streets can and must be reprogrammed, too, no longer subject to the ridiculous autopoietic logic that expanded highways through iterative accommodation. The effort to shape the urban environment in response to the impending autonomous automobile platform rather than have the automobile platform fully succumb to the inanity built into modern automotive infrastructure might be most poised in places such as London, which, modeled after the horse and cart, never accommodated the car comfortably to begin with. Coordinated vehicle operations and fleet services inevitably mean a change in the city-computer overall, from disappearing surface hardware—lights, road furniture, the clutter of cars—to the opening of space for people, foliage, and other mobility modes. The sooner cities start to reorganize their interdependence, coordinating themselves around autonomous automobility, the sooner autonomous automobility will come.

As evolutions in AVs play out, a further reduction in the functions of driving threatens their full disappearance. Urry's term “driver-operators” describes the human driver that both drives the vehicle (as a function of steering) and manages some vehicle operations (supervising and maintaining some of its basic functions). A driver might no longer refer to an operator; they might be the director or designer of the journey in the first place, introducing high-level parameters by which the car-operator might take decisions, with some degree of selection in the factors that determine such and such route. To drive no longer means to control at the level of the immediate decision or operation but to power, propel, and compel at a deeper and higher systems level.

Notably, this degree of connectivity and contingency, the platformization of the automotive network in conjunction with the platformization of the city, may in many ways make the car overall less autonomous from its context, since each agent becomes algorithmically tied to all the other information and all other agents as it moves around the city and the city moves around it.

From Devices to Environments

Highways have always been machine spaces, “human exclusion zones” where an exoskeleton is required to navigate their affordances. Today on a highway, it’s quite easy for any motorized vehicle to reach full autonomous mode. It is harder to ensure that an AV is ready to navigate the unexpected worlds of urban streets, which have to share the dominant machine space with other mobile beings—pedestrians, dogs, delivery robots, skateboarders, etc.

Humans are almost always somewhere in the loop of the process of things becoming automated. It’s common knowledge for AV developers that it’s far harder to provide safety for Levels 3 and 4 than for Level 5, in large part because human attention does not choose wisely when it comes to the split second. The incessant information platform of the phone has become an extraordinary distraction for drivers, but it’s even harder to concentrate on supervising a machine, occupying only part of human attention, than on totally driving it yourself.

One of the first AV accidents took place in 2018, when a self-driving Uber in Arizona crashed into Elaine Herzberg, who was killed crossing the street with her bike. The incident occurred because the supervisor, who was meant to be overseeing the vehicle, was watching livestream and did not have time to override the failed detection system in the darkness. It is more notable that Elaine’s family did not sue the driver or Uber but the city itself, because *the road* affordances suggested an opportunity for safe crossing but did not actually provide a reasonable place to do so for pedestrians or cyclists like Elaine. AVs only exposed the limited design of Tempe’s urban infrastructure and its failures to accommodate multimodality in succumbing to a singular automotive logic.

For now, in America, China, Brazil, and many other parts of the world, the streets are a wilderness of hybrid machines that increasingly drive on their own, intermingled with distracted humans trying to operate them manually. Sometime soon it will be difficult to fathom the ridiculousness of organizing urban environments around parked automotive machines. One can imagine an urban environment in which humans, or motorcars, or bikes, or golf carts, or buses might become the prioritized transport means to which the rest of the city bends. Driving games might become **labeling games**, in which humans teach AVs how to interpret and “read” the city and its various objects.

The AV problem is not primarily a device-or agent programming problem but mostly an environment-development problem. As we have seen, the more intelligent cultivation of a multipurpose environment would actually set the conditions and terms for AV development and the conversion of contemporary outmoded infrastructure, working backward from function rather than attempting to navigate the terrain accidentally developed at the behest of an automotive ownership principle based on delusional autonomously instead of collective contingency.

AUTONOMY: FROM INDEPENDENCE TO INTERDEPENDENCE:

There’s a simple solution to our traffic problems. We’ll have businesses build the roads, and the government build the cars.
— Will Rogers

In Pursuit of Auto-Governors

Autonomy has long been a beacon in the philosophical and political pursuit of technology and philosophies of governance, from diagnosing the animalistic drive to escape to the design of political systems that can self-govern and regulate without dictatorial control. Autonomy is similarly championed as the goal of Marxist visions of work and is often understood as a means of self-ownership and power. There are quite substantial trade-offs to this model of autonomy as a pathological panacea. The evolution of platform automation and its automobilic legacy and speculative futures has made these trade-offs more prominent.

Social philosopher of the late twentieth century André Gorz provided one of the most profound and cutting critiques of the promise of the automobile. According to Gorz, the problem with the shift to personal vehicles is that they are a luxury rather than a necessity. His insight was that vehicles themselves are a geometry problem, not an efficiency problem. Traffic becomes a problem of inefficient handling of capacity. The automobile is the paradoxical example of a luxury object that has been devalued by its own spread. [48] As long as the nuclear automotive chassis remains the same size, this problem of human drivers or driver-operators remains. Space cannot infinitely accommodate luxury for all at the same scale.

labeling games

Imagine that when you buy your first autonomous vehicle in the future (if individual ownership model persists), you will be invited to take the care on the first “initiation drive” when you’ll spend long hours guiding the car through the city and helping it to understand the environment from your nuanced point of view - a form of labeling game in the wild.

The history of the traffic light

History of traffic lights is also a history of relying on manifold little automatisms baked into human cognition - e.g. the choice of red colour linked to easier visibility for human eyes across longer distances.

In this sense, designating AVs as a solution to mobility problems remains a misnomer. There is a pathological focus on making automobiles autonomous by adapting the driver-operator function rather than holistically considering the environment and other mobility modes that might be integrated. Rather than being obsessed with personal AVs, given the legacy of the automobile's impact, the myriad other forms of mobility that might be augmented or programmed by the city should be considered first and foremost.

The history of the traffic light catalyzes the history of regulation in relation to automobiles. The first traffic light was installed as early as 1868 to automate traffic flows, and eventually the color-light system came into effect. As traffic lights became more and more part of urban-scale programming, they demonstrated that the autonomy of the automobile was completely contingent on the design of streets to ensure safety and smooth flow. The traffic light is a governance device: it regulates autonomy. Autonomy can be achieved only within constructed limits that ensure and secure it, a framework that organizes the terms of interdependence in which actions can happen.

The most powerful interruption to the entire twentieth-century automotive complex and economy was not a technical innovation but a primarily social one. The introduction of Uber and other rideshare platforms demonstrated something that had been pivotal to social and economic logic since the time of Ford. With rideshare, car ownership was no longer a required paradigm, and driving was no longer required to achieve mobility. Rideshare became one of the most easy-to-access jobs in any economy, while liberating the disabled, the impaired, the caretakers, and the inebriated from the normative mobility requirements needed to be mobile in the Ford system.

During the Enlightenment, Kant framed autonomy as the freedom to make moral judgments independent from class or social positions, to rise above sensory, sensational, or emotional aspects, and to use independent reason to establish an ethics that could ostensibly be universal. This version of autonomy highlighted the cold rationality of unencumbered decisions, which gave way to the modern individual. Only later did autonomy come to mean self-governance in the sense of independence from a higher authority or decision-making. Autonomy was construed as the right of individual choice and decision above and beyond the collective; eventually, mass society and democracy connected autonomy to market choice.

Certainly, this modern definition of an autonomy of free will and independent control limits and hinders the imaginary of sociotechnical systems to the small-scale operations of devices or individuals. There is, however, another way to understand autonomy in relation to sociotechnical systems—not as the capacity for explicit self-governance but as a series of negative freedoms, as Paul Preciado puts it, that enable a reflexive and unconscious automation. [49] In this sense, autonomy is a *freedom from* obligations such as conscious decision and/or operational occupation rather than a *freedom to* do such and such action. Autonomy can be produced by automation—enabled by the preprogrammed operations of well-habituated activities that, relegated to subconscious infrastructure, open the capacity for the brain or body to do other things.

Ryan Bishop notes how the very premise of autonomy generates this paradox through historical evolution. "The autonomous system might well create an 'omnivorous world' of its own fashioning, but it has not done so ab nihilo. There is a long-standing tradition—indeed, a *nomos* (which means 'tradition,' as well as 'Law')—in the formulation of techniques and the autonomous. . . we have reached a stage of technological systems as autonomous but without the *nomos*, yet still driven by an auto propulsion toward some *telos* that eludes or erases us." [50]

In the case of technological systems, there remains a question of what the trajectory of autonomy might be, and the ways in which, as Bishop describes, auto-propulsion might be informing or hindering that path. Perhaps the pursuit of autonomy in the trajectory of independence is exactly how to preclude autonomy from the various factors that constrain us.

The Problem and Potential of Work

The potential for autonomy, especially in relation to automation, regularly appears in conversations about the future of work. Here, autonomy is considered in terms of not only freeing human brains from the labors of decision or freeing people from the labors of the body but also the ability of those whose labor is invested in production to have a say in the direction of resource distribution.

Marx's famous "Fragment on Machines" describes a new phase of labor relations once workers are no longer needed to serve as the intermittent operating units feeding machines. Under capitalism, labor is subservient to the machines as fixed capital, a fully automated system that no longer requires the human to think or perceive itself as such and no longer requires the same level of submission.

Once adopted into the production process of capital, the means of labor passes through different metamorphoses, whose culmination is the machine, or rather, an automatic system of machinery (system of machinery: the automatic one is merely its most complete, most adequate form, and alone trans-

49. Preciado, "Can the Monster Speak."

50. Bishop, "Smart Dust."

forms machinery into a system), set in motion by an automaton, a moving power that moves itself; this automaton consisting of numerous mechanical and intellectual organs, so that the workers themselves are cast merely as its conscious linkages. In the machine, and even more in machinery as an automatic system, the use value, i.e. the material quality of the means of labor, is transformed into an existence adequate to fixed capital and to capital as such; and the form in which it was adopted into the production process of capital, the direct means of labor, is superseded by a form posited by capital itself and corresponding to it. In no way does the machine appear as the individual worker's means of labor. Its distinguishing characteristic is not in the least, as with the means of labor, to transmit the worker's activity to the object; this activity, rather, is posited in such a way that it merely transmits the machine's work, the machine's action, on to the raw material—supervises it and guards against interruptions. Not as with the instrument, which the worker animates and makes into his organ with his skill and strength, and whose handling therefore depends on his virtuosity. Rather, it is the machine which possesses skill and strength in place of the worker, is itself the virtuoso, with a soul of its own in the mechanical laws acting through it; and it consumes coal, oil etc. (*matières instrumentales*), just as the worker consumes food, to keep up its perpetual motion. [51]

Once adopted into the production process of capital, the means of labor passes through different metamorphoses, whose culmination is the machine, or rather, an automatic system of machinery (system of machinery: the automatic one is merely its most complete, most adequate form, and alone transforms machinery into a system), set in motion by an automaton, a moving power that moves itself; this automaton consisting of numerous mechanical and intellectual organs, so that the workers themselves are cast merely as its conscious linkages. In the machine, and even more in machinery as an automatic system, the use value, i.e. the material quality of the means of labor, is transformed into an existence adequate to fixed capital and to capital as such; and the form in which it was adopted into the production process of capital, the direct means of labor, is superseded by a form posited by capital itself and corresponding to it. In no way does the machine appear as the individual worker's means of labor. Its distinguishing characteristic is not in the least, as with the means of labor, to transmit the worker's activity to the object; this activity, rather, is posited in such a way that it merely transmits the machine's work, the machine's action, on to the raw material—supervises it and guards against interruptions. Not as with the instrument, which the worker animates and makes into his organ with his skill and strength, and whose handling therefore depends on his virtuosity. Rather, it is the machine which possesses skill and strength in place of the worker, is itself the virtuoso, with a soul of its own in the mechanical laws acting through it; and it consumes coal, oil etc. (*matières instrumentales*), just as the worker consumes food, to keep up its perpetual motion.

While Marx remained concerned about substitution rather than the secondary functions of the worker in the distribution of means, the implication of the "Fragment on Machines" remains one of the most prescient passages in history. Eventually, the worker finds autonomy by becoming entirely autonomous from work.

Who, then, is a worker, anyway? One of the contradictions that autonomy garners is the vacillation between the desire to be liberated from work and the desire to maintain the pleasure and satisfaction of purpose that comes with work. The greater existential concern of course is what humans will be if they become autonomous from work. True autonomy is thus something else that is much harder to conceive: rather than presume a utopia, in which there is no work and exclusively leisure, autonomy can be understood as labor without contingency, work as exclusively that

labor pursued for pleasure.

Another way to imagine this paradigm is not that there would be no labor, but that survival or need would not be contingent on it. Norbert Wiener wrote in *The Human Use of Human Beings*, "It is a degradation to a human being to chain him to an order and use him as a source of power, but it is on almost equal degradation to assign him purely repetitive tasks in a factory to man less than a million of his brain power, but it is simpler to organize a factory or gallery which uses individual human beings for a trivial fraction of their worth than it is to provide a world in which they can grow to their full stature." [52] Autonomy in its positive and constructive sense does not mean the complete decoupling of work from life, but it does mean the decoupling of work from necessity to realize basic need. Work may look more like care, or work performed with a collective purpose, or philosophy—something that commands dedication and attention and commitment but whose momentum is driven by an intrinsic force rather than external pressure.

Contemporary conversations around platforms often focus on critiques of capital accumulation. The Fordian mobility paradigm of personal ownership modeled a paradigm of autonomy that may, in a new realm, transpire as exactly the opposite of personal ownership—a structure for sharing, distribution, and coordination, governed explicitly by principles of use rather than ownership. Instead of the collective becoming a function of continuous negotiation of authority and power via ownership, autonomy transpires as independence by way of interdependence. The relegation of trusted authority becomes an aspiration rather than being disavowed. Converting the infrastructure of singular automobiles to a concrete platform for

51. Marx, "Fragment on Machines," 692.

52. Wiener, *Human Use*, 16.

labor pursued for pleasure

The idea of labour pursued for pleasure still aligns with the Marxian vision, as long as it is not the wage labour anymore, hence not subject to the class division between those that sell their labour and those that own the means of production. Marx and Engels in *German Ideology* (1845) thus write: "In communist society, where nobody has one exclusive sphere of activity but each can become accomplished in any branch he wishes, society regulates the general production and thus makes it possible for me to do one thing today and another tomorrow, to hunt in the morning, fish in the afternoon, rear cattle in the evening, criticise after dinner, just as I have a mind, without ever becoming hunter, fisherman, herdsman or critic."

shared transport, the entire transport stack—from streets to autonomous robot agents—coordinates across layers, opening space and time only possible through a shared autonomy at scale.

AUTODESTRUCTION: FROM DEATH DRIVE TO PERVERSIVE PLEASUREY:

The car crash is a fertilizing rather than a destructive event.
— Vaughan, *Crash*

Planetary Perversions

There is something deeply pathological about humans hurtling across concrete highways in little metal boxes, a pathology that rapidly scales from the individual death drive of the compulsive need to drive the motorcar to the planetary-scale ecological destruction it now continues to precipitate. Is the profoundly autodestructive aspect of automobility reflective of a deeper, inescapable impulse of the human condition, something fundamentally incommensurate between the evolved drives of the auto-self and the inevitable orders of planetary interdependence and contingency? Would it be possible to somehow leverage that pervasive impulsive derangement to surpass the limitations of the self-driven human drives at an eco-systemic scale toward collective thriving? Would this have to develop out of resistance or contradiction? How might we process the erotics of this tension, not as surplus or something outside the logic of platform automation but as a structural part of the deeper rationality of grappling with the process of autodestruction and regeneration?

In 1970, J. G. Ballard presented *Crashed Cars* at the New Arts Laboratory in Camden Town, London. “Adjacent to the busy Hampstead Road and opposite an imposing high-rise housing estate, the exhibition was situated in just the kind of post-industrial hinterland that Ballard frequently featured in his fiction.” [53] Three crashed cars were displayed—a Pontiac, a Mini, and the A60, selected for their styling and traversal of various periods. “The Pontiac was a model from the mid-fifties, and thus represented a particularly baroque phase in American car styling, while the Mini symbolized the fun-loving mobility of the swinging sixties. The sober and conservative saloon, the A60, stood for the Mini’s exact antithesis.” [54] The opening evening staged automotive debauchery, with topless waitresses and closed-circuit cameras ready to capture the social trauma of the autodestruction on display.

The evening delivered exactly as suspected. On opening night, a woman serving as host was sexually assaulted. Visitors attacked and vandalized the three wrecked vehicles with wine, paint, and urine. The presentation of automotive passion and rage in its disaffected and debased state unleashed dystopian aggression, violence, and libidinal energy. The exhibition succeeded so completely that it prompted Ballard to follow up with the novel *Crash*, published in 1973, which David Kronenberg then turned into a film.

In *Crash*, Ballard details “a new sexuality born from a perverse technology.” [55] Ballard’s brilliance lay in identifying how the incapacity to process systems failure at such an expansive scale would, at the individual scale, warp into sociosexual perversion, transforming the destructive into the erotic and vice versa. In the book and film, accident scenes become fetish sites. The slow motion, memory-searing, and erasure of accident time becomes the setting for a traumatic replay. Forensic details become pornographic fragments. Entangled autobody parts and human body parts become estranged and eroticized amid the smells of a broken and deteriorating machine.

Crash demonstrates the recursive psychodynamic effects of the automotive complex and diagnoses the connection between risk and desire. Systems alienation becomes a generative autoerotic form of intimacy and perversion. The daily act of driving embeds the risk of death in the most mundane of everyday acts. *Crash* draws out sublimated risk and the erotic oscillation between overcoming it and submitting to this risk, but this subsumption is not only to that of a single accident. The planetary-scale social accident that is the automobile also fuels autogenesis. It finds in death’s aftermath or the atrocious end a vitality of life, the drive of volition itself, propelling it in some sort of raw and unadorned form.

In this way, *Crash* deals a final blow to any romanticized link between sex and nature. The fetish allows its characters to reclaim intimacy via a completely unnatural system, a system that is itself in ruins. *Crash* generates pleasure by exploiting an exploitative system, a completely legitimate expression of social life in its own right, which is already built on the auto-production of violence. Here, *perversion*—hyper-distortion, focused obsession, intent falsification—renders the real by exposing its irrational underpinnings and embracing constraint as desire.

At a human scale, the automobile manifests perverse passion, exhilaration, and facility because of its unusually comprehensive merger between machine and human. The risk of death is bound together with momentum as a function of basic performance. The ease of violating safety becomes a constant fantasy, from driving as fast as possible to veering off course. Lacan famously refused to stop at red lights [56], an apt metaphor for an analyst who imagined change almost exclusively

53. Ford, “Psychopathic Hymn.”

54. Ford.

55. Ballard, *Crash*, 7.

56. Webster, “Riding in Cars.”

at the level of the individual, an individual who remains in continuous resistance to their service to the grand machine.

Perversions, defined as psychodynamic incommensurability between experience and mental model, also happen in systems and at planetary scales. Here, they are less reflective of brain-based neuro-alignment than of irrationalities, distributions, and flow that undercut the logic of the broader systems in which they operate. Perversions at the individual level accommodate those at a social-system scale, however despicable, where the misalignment between resources, incentives, and labor results in exploitation and destruction. In classical Freudian theory, the death drive is the tendency or proclivity toward death expressed through aggression, repetition, and self-destruction. At a planetary scale, the car has been the perfect object in which to sublimate and activate this death drive vis-à-vis the pleasure principle.

There is a robust consensus among driverless AV engineers and human factors researchers that in order to get the general public to trust vehicles without human drivers, they will need to be more reliable than humans themselves. Put more simply, humans are far more willing to put up with death caused by human errors than by machines. The sheer number of car accidents provides devastating numbers of casualties, but humans will most often select to have more human drivers and more deaths instead of submitting to technological casualties—a proclivity for control in spite of inevitable autodestruction. Ballard's automotive debauchery—the combination of desire, waste, sublimation, and longing—demonstrated the perverse erotic relation between humans and machines, machines and environments, energy and power. And by addressing this through sexual perversion, at once embodied and disembodied, the psychoanalysis of the system would not be leveled at the individual but at the infrastructure and landscape.

Crash entangles

One can also read *Crash* in a Lacanian register. The car is the perfect analyst - the silent listener, the perfect mirror that enables the analyzed individual to eventually become the unconstrained subject of their desire.

Crash entangles the death drive and the pleasure principle as a coping mechanism. The tendency toward repressive avoidance is channeled into a shared sensuality of machine seduction. This seduction is the outcome of the utter failure of infrastructure to provision basic channels for life. Humans are reflections of the fetishes and perversions of the system of which they are a part as much as the system reflects their own perversions.

Perpetual Physics

The fantasy of everything always moving is at its core the displacement of home, which is also a displacement of origins. [57] In its simplest form, autonomy might be understood as the capacity to move. The automobile perpetuates the fantasy and forms of ceaseless movement in the vantage of motion pictures.

Films about cars and movies in cars contend with the duplicitous metalevel of continuous movement of the camera (the apparatus of capture) and the world in motion around it. In *Mad Max*, the point is to *never stop moving*. In *The Chase*, a hijacking turns into a charged sexual encounter, as the small space of the car turns the motives of its protagonists toward one another. In Tarantino's *Death Proof*, the physical limits of bodily risk are tested with and on the car form as the core of eroticism, a machine to be ridden on rather than in. In Godard's *Weekend*, a traffic jam caused by a series of violent accidents leads to a return to the jungle, with civilization eschewed for the slip into a primitive social momentum. In *Titane*, after surviving a childhood car accident that left her with a titanium plate in her skull, a woman develops an intense attraction to metal and machines and is impregnated by a flame-emblazoned Cadillac.

When the thing that haunts everyday car movement—the avoidance of the accident—has finally been undone, perversion can take place not in secret but as a function of public contention with society around it. As Gramsci, Bataille, Marcuse, Mark Fisher, and Žižek all point out, there is no greater simultaneous production and repression of erotic pleasure than capitalism, since the erotic, as a model of pleasure, exists separately from production or consumption but shares the logic of infinite unfulfillment. The car always presented a hyper-erotic function masquerading as a practical function, from symbols of status to speed, aggression, and women's liberation. The levels of regulation within the car and that which the car demands as part of automotive infrastructure provide constraints on public space and large-scale production while perpetuating the desire for infinite expansion.

It is time to queer the chassis. Perhaps the combination of AVs and integrated urban computational platforms might finally break the constraining pathology of the fixed platform chassis built for a nuclear family of five, toward a diversity of vehicular forms, smaller and bigger, for one or for many people at diverse and multimodal scales, rightsized spatially and energetically for the missions at hand. Queering the chassis might lead to the diverse proliferation as well as standardization of the new correlations that the platform infrastructure enables, both for human mobility and for the goods and services that demand it.

There have been many discussions about what humans might possibly do in cars once they no longer have to drive them and own them. Vehicles will surely not only move people around but become **places that come to you**. They will likely become on-demand mobile stores, arcades, bathrooms, workspaces, micro-movie theaters, and temporary hotels. The new functions of automotive desire might look much less like your car as a status symbol externally and will more likely reflect desire as it relates to function.

places that come to you

The idea of mobile rooms temporarily assembling around you according to your needs reminds me Benjamin Bratton's very early concept of "habitable circulation" from his introduction to Virilio's *Speed and Politics*.

Now the point is to literally get inside the automaton, to succumb to it. If modern space was all about a frictionless, streamlined, seamless, and smooth space planned from above, the process of platform automation requires the constant navigation of contingency and constraint, submission and resistance. Like amusement park rides, the point is to submit, to turn over the body to control through machines. This too is a form of autodestruction. The operator dies. A rider is born.

Coordination over Control

The question of accidents triggers the most popular concern around AVs, the potential for them to veer “out of control.” This might refer to hardware or software. It may mean that the operational programming was not equipped to handle the reality of a circumstance (reality exceeds the program), which can result in an internal or external error. There might also be a mistake, glitch, or oversight, which may occur because there are new circumstances unanticipated by the program, which is then unable to adequately diagnose the circumstance or situation, or because of a mechanism failure, which may be exacerbated by failed maintenance.

In the case of AVs, susceptibility to small, local accidents decreases, but the potential for large-scale disasters—at the level of jams, codes, hacks, mistakes, or large-scale collision—increases. James Bridle famously trapped an autonomous car in a circle simply by drawing a white line around it. [58] The opposite presents a larger-scale fear—what if fleets of vehicles refuse to follow the rules prescribed to them, either by malfunction or by developing their own independent volition? As Lacan quipped:

Think of these little automobiles that you see at fairs going round at full tilt out in an open space, where the principal amusement is to bump into the others. If these dodg'em cars give so much pleasure, it is because bumping into one another must be something fundamental in the human being. What would happen if a certain number of little machines like those I describe were put onto the track. Each one being unified and regulated by the sight of another, it is not mathematically impossible to imagine that we would end up with all the little machines accumulated in the center of the track, blocked in a conglomeration the size of which would only be limited by the external resistance of the panelwork. A collision, everything smashed to a pulp. [59]

The description of the track and its discontents certainly suffers from the imposition of human tendencies onto automatic systems. But it also points to something interesting about autonomous systems in relation to control, operation, and accident, which is that systematization doesn't inherently override drive. What is allowed or enabled in amusement is precisely that which the whole premise of real driving is designed to avoid—bumping into other things. This delusion is also dismantled at the social scale, since any projection of a singular decision-making capacity at the scale of the vehicle must confront the fact that while it indeed has individual features that may determine whether it succeeds or fails, it is far more contingent on the general system at large to be well-maintained and functioning correctly. And this perhaps exposes, beyond the neoliberal ideology, how humans also map onto a much more expansive and risky equation: of being shaped by, dependent on, and contingent on the broader social system in which each human operates.

Intentional Accidents for Autobodies

Perhaps we should understand the momentum of platform automation as itself a dialectic death drive that switches from species to system and back again. This would demonstrate a suicidal wish that sweeps beneath reproductive capacity—one that may also infect machinic production, depending on programming, capacity for maintenance, and autonomy.

Regardless of known calculations of the existential impact of the climate crisis, in many ways precipitated by this automotive complex, internal combustion, assembly production, economic capacity, capital conquest, and cultural perpetuation lurch forward at an ever-accelerating planetary scale at the behest of the things in their wake. This planetary death drive might also be understood as an initial desire, curiosity, or proclivity hinged on a *pleasure principle*—the pursuit of speed, immediate access to freedom, the reproduction of the body via an exoskeleton, to inhabit another body, to *get inside the machine and to merge completely with it*.

These drives might well be part of the automotive complex that, driven by momentum, cannot construe a time frame beyond it, that cannot see or model its evolution into something else, that would more easily imagine catastrophe or crisis than the outmoding of its rationality. In this way, the pleasure principle rubs up against the reality principle—the automobile made each human complicit in a folding inward of the world, hinged on violence and volition. The personal motorcar generated incredible capital momentum and cemented capitalism, what with **its mass promiscuity**. It celebrates the obfuscation of momentum via relativity of that which proceeds and builds on that which comes before and the delusion of independence from all around it.

In *Motives and Drives Are Computationally Messy*, Patricia Churchland describes how the pattern recognition regime still lacks the flexibility of transference from one regime to another, questioning the liberal use of intelligence that has come to also characterize programmable automobiles. “Go ahead and market something

58. Bridle, *Autonomous Trap* 001.

59. Webster, “Riding in Cars.”

its mass promiscuity

It has numerously been argued that the automobile and highway also enable the “serial killer” to come into view as a prominent cultural category. The heightened auto-mobility offered new opportunities for strings of murders: to kill across state lines, such that regional police departments could not immediately connect the dots.

as ‘intelligent’ but if it is brittle, lacks flexibility and common sense and has nothing approximating motivation or drive or emotion or moods, it may be difficult to persuade the rest of us that it is intelligent in the ways that biological entities can be. Redefine ‘intelligence’ you may, but the redefinition per se will not make the machine intelligent in any recognizable sense.” [60] In practice, the modeling of one situation and mapping it onto another does require a higher-level abstraction, but this abstraction then gets lodged into situations that prohibit the transfer based on context or scale. The only way to form this abstract transfer may be by destruction or deconstruction, the intentional jarring and dislodging of the scaffolding by which progressions are intended to course.

One could certainly diagnose the automotive complex as hedonism, or as the masochistic brutalization of instant gratification, or as the hubris of domination, or as the anal obsession with control. Others might diagnose it as the hysteria over fear of others—strangers in public space—or as the desire for continued conquest and consumption, or the delusions of discovery and dominance by land, air, and sea. It might also easily be diagnosed as a disavowal, a refusal to confront what can be known about the damage the automotive complex is causing, since the responsibility for it cannot be conceived directly and the factors are too many to influence. It could be seen as romantic, as the distance between the moving screen and the surrounding world constructed a false distance and delusion as per its peripheral impact. The complex may actually be too complex to diagnose, because various factors have persistently managed to treat significant indicators as externalities, or because the system is not rendered adequately enough so that it is capacitated.

The operator whose role has been relegated to oblivion no longer battles the death instinct, since the riskiness that was once in the hands of the human driver-operator is now in the hands of a driver-agent who is evolving, adapting, and learning across local, distributed, and centralized levels. A glitch or bug at the edge might penetrate the shared management system, just as the edge might not be free from central failure. This compels us toward system frameworks that leverage rather than resolve the paradoxes inherent in the auto. Rather than considering the death drive only in terms of its psychodynamics, we must also consider it in terms of a trauma of more expanded proportions that asserts itself within the confines of infrastructural systems themselves.

In *The Copernican Revolution*, Laplanche reminds us to “remember that a revolution is never as revolutionary as it thinks—it has its forerunners in the past. And what it offers as a new opening also carries with it possibilities for potential relapses.” [61] The death of the operator confronts the death drive by way of the autobody, and this death drive is not the same as that of the past. It is an autobody that is reawakening to recognize that it is indeed monstrous, that it inhabits the entire organs of the infrastructure it has built in forms that exceed its purpose.

At unprecedented scales of platform automation, the paradigm of auto, born of its own simultaneous destruction and regeneration, is transgressing its own scaffold, evolving into something strange and new. This autodestruction built into the early Autocene might well be its pathology as well as its remedy: the same impulse that forces the compulsion of repetition also propels it toward the pleasure of perpetual reiteration. In the latter, a program allows its unresolved glitches and the aspirations of the Fordist legacy to fold into an opposite order of auto-regeneration, urban-scale computation, mobile-platform diversification, and a post-ownership geometry. These are all scaffolded by the standardized platform of the traffic game and the urban environment that constrains its evolving agents, automotive agents that need to be only as intelligent as the city surrounding them demands.

60. Churchland, “Motivations and Drives.”

61. Laplanche, *Essays on Otherness*, 4.

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