Whose Streets? Anarchism, Technology and the Petromodern State

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> The authority of the modern state cannot find a solution, of course, because it has come to encompass every aspect of the problem itself. In fact, disaster tends to fuel the system that generates it, which means that we must also abandon the pathetic hope that perhaps this latest horror will be the signal that turns the tide (as Chernobyl was supposed to be, and Bhopal).[1]

There are an estimated 200,000 to 300,000 tonnes of waste from nuclear power plants in the world, and this waste will be around for about 100,000 years.[2] Almost one million cubic metres of radioactive waste have been dumped into the oceans. Almost 90% of the trash in the ocean is plastic,[3] dispersed over millions of square miles, and may take a century to biodegrade. The stuff that biodegrades faster than that, releases toxic chemicals that interfere with reproductive systems.[4] A 2011 study by the International Programme on the State of Ocean (IPSO) warned that ocean life is on the brink of the worst mass extinctions in millions of years.[5] 'As goes the ocean, so goes life', Alanna Mitchell reminds us.[6] The now-familiar effects of global climate change increasingly appear to have been underestimated, and 'weird' weather and other disastrous consequences have become common occurrences. Peak oil. Peak soil. Peak water. 'Over the next 100 years or so as many as half of the Earth's species, representing a quarter of the planet's genetic stock, will functionally if not completely disappear', writes Stephen Meyer. 'Nothing – not national or international laws, global bioreserves, local sustainability schemes, or even "wildlands" fantasies – can change the current course. The broad path for biological evolution is now set for the next several million years.'[7] Scientists call this the anthropocene, a name that denotes the impact of human beings on global ecosystems. Many consider this the age of 'collapse',[8] an inevitability about which the only questions one can summon concern its 'pace and consequences'.[9]

The horror show of global capitalism, centuries in the making, may appear to be reaching its end – what ubiquitous philosopher Slavoj Žižek calls its 'apocalyptic zero-point' –[10] with a combination of rapid resource depletion, ecological

evisceration and financial meltdown. Yet any expectation that such conditions will necessarily generate the requisite revolutionary forces to transcend capitalism is far behind us. Capital has always thrived on catastrophe, drawing on its own bitumin-ious byproduct to stimulate further economic growth and entrenchment, whereas a critical mass of revolt has mobilised only sporadically. Witness the relative timidity of popular resistance in industrialised countries following the $16 trillion bank bailouts from 2007 to 2010,[11] or the LIBOR interest rate-rigging scandal affecting $350 trillion in derivatives. The multiple crises of capitalism, global in scale and lethal to all forms of life on the planet, have not convinced most people participating in capitalist economies to retreat from the precipice. As the tipping point for runaway climate change looms, and with the sixth mass extinction event in the history of planet earth already in full swing, substantial and prolonged public revolt is replaced by resigna-tion, techno-optimism and reactionary retrenchment. No, this is not the End Times. This is the beginning of an attenuated disaster ensured by the material tendencies of petromodernity,[12] forms of 'slow violence' such as global warming,[13] mass extinction and nuclear contamination, which will inhabit the imaginable future to some extent no matter what human beings do.

In the context of prolonged crises, the relationships between anarchist politics and twenty-first century technologies will continually emerge as critical elements of practice and theory. Anarchists must theorise revolutionary conjunctions with technology even as we experiment with technological invention and destruction. We hope this issue of *Anarchist Studies* provides incentive for others to expand the discussion of anarchism and technology, provoking more interest in the anarchist tradition for scholars of technology, and more interest in the history, philosophy and politics of technology for anarchist scholars and activists.

1. IN THIS ISSUE

The opening piece by Ben Brucato applies some clear terms to the challenges faced by anarchists and their allies in confrontation with the 'peak everything' scenario of absolute resource scarcity and potentially-runaway climate change. Brucato prob-lematises a set of scenarios proposed by commentators on the converging crises of the twenty-first century, then turns to a reading of post-anarchist theory that emphasises the critique of universalism and the prefigurative refusal to leave the construction of alternatives until 'after the revolution'. The article concludes by discussing criteria for an evaluative politics of technology that places social justice, participation and popular expertise at their core.

In his contribution to the archaeology of anarchist discourse, John Duda locates the entry of self-organisations to prominence in the movement's intellectual vocabu-

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lary. Far from a perennial hallmark, the wide use of this concept can be traced to a specific encounter in the early 1960s between libertarian politics and cybernetic science – a debate in the pages of Colin Ward's journal *Anarchy* between Grey Walter, a neurologist and robotics pioneer (and father of the anarchist Nicholas Walter), and computer programmer John McEwan. These two authors drew on then-novel developments in informational science to suggest productive models for non-hierarchical organisation, a theme which was later enthusiastically taken up by Ward himself, as well as by Paul Goodman and Sam Dolgoff. In unearthing the traces of this conceptual journey, Duda critically points to the need to unpack the natu- ralised and taken-for-granted uses of concepts in anarchist parlance, which are often weakened by their loss of important layers of specific meaning.

Finally, we have initiated an email exchange on technological politics between Matt Wilson and Dmytry Kleiner. These two activist-intellectuals approach tech- nology from quite different backgrounds – the former strongly rooted in the environmental direct action movement and sympathetic to primitivism, the latter a talented programmer and part of a hacker and artist collective exploring communistic virtual production. Their discussion is a very productive one, taking in its stride many of the thorny dilemmas that activists confront in their day-to-day interfaces with technologies. These range from the significance of the Internet's material infrastruc- ture to the capture of its liberatory potential by capitalism, and on to visions for the role of digital media in a world beyond capitalism.

2. ANARCHISM AND ASSEMBLAGE

Marxist geographer David Harvey considers it 'one of the acute failures in the history of actually existing communisms' that they have avoided the questions of 'the defini- tion of an alternative technological basis as well as alternative relations to nature, social relations, production systems, reproduction through daily life and mental conceptions of the world'.[14] In short, everything anarchists have been living and talking about. Clearly there has never been a consensus among anarchists regarding the definition of technology or its revolutionary application, but the dimensions of its 'curious ambivalence' are today quite clear.[15] In recent decades, two major articu- lations of an anarchist politics of technology have emerged: one from direct action environmentalism and solidarity with indigenous struggles, which finds perhaps its boldest expression in the primitivist critique of civilisation;[16] and the other from hacktivism and the free knowledge movement, which is explored in often implicitly anarchist writings on digital communism and anonymity.[17] These two perspectives have enjoyed little cross-pollination, and each has its own limitations. Primitivist language often portrays the technological 'megamachine' in monstrous terms,

distracting from higher-resolution analysis of the social shaping of technology per se. Writings emerging from the hacker environment, for their part, remain largely circumspect in the digital and fail to account for its dependence on material technologies with all their concomitant impacts and crimes. As the scales tip for industrial civilisation, anarchist theory thus continues to thirst for sustained and specific engagement with technology, on registers that are relevant to anti-authoritarian values and strategies.

In introducing this issue, we wish to explore two broad themes that we believe can offer points of departure for such engagement. First, we wish to point to some critical moments in the varied anarchist response to technology; and second, we wish to draw from contemporary historians of technology informed by Science and Technology Studies (STS) to stress how the state, or to be exact the petromodern state form, has created prolonged and converging crises. Our central contention here is that the concept of sociotechnical assemblage – a key concept in STS that articulates the social as 'not a thing, but a type of relation or, better, associations between things which are not social by themselves' –[18] has in some sense been present in anarchist thought since Proudhon, however radically different its ontological properties are today. Essential to the contemporary expression of sociotechnical assemblages are the forms of 'slow violence' latent within technological legacies of the petromodern state form, which have produced many of the ecological conditions in which anarchists now struggle with various forms of oppression. In particular, we discuss the historical formations of infrastructure as central to the development of an anarchist politics of technology in the present.

While Karl Marx is often cited as the earliest modern socialist to address the centrality of technology to industrial societies, it was in fact Proudhon who 'supplie[d] the impetus for Marx's turn to the study of machines and, more broadly, to science and technology as a terrain in which political and economic questions were increasingly salient'.[19] In *The Philosophy of Poverty* Proudhon declares that 'what the economists ought to say is that machinery, like the division of labour, in the present system of social economy is at once a source of wealth and a permanent and fatal cause of misery'.[20] Machines increase production volume (albeit at the expense of quality) and, by replacing workers, reduce wage expenses and enable the capitalist to sell cheaper on the market. But at the same time the workers' buying power is reduced and the economy enters a crisis of over-production. 'Thus machinery, after crushing the workmen, is not slow in dealing employers a counter-blow; for, if production excludes consumption, it is soon obliged to stop itself'.[21]

Marx criticised Proudhon's idealisation of artisan's biases, which ended up glorifying the mechanised independent workshop as a site at which 'the antinomy of the division of labor, if not entirely destroyed, will be balanced and neutralized'.[22] Yet

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he concurred that 'by the introduction of machinery, the division of labour inside society has grown up, the task of the worker inside the workshop has been simplified, capital has been concentrated, human beings have been further dismembered'.[23] Marx would have much more to say about capitalist accumulation, but it is evident that both he and Proudhon were coming to a similar understanding of the basic dynamic of overproduction in 1846-7.

Furthermore, Proudhon's core account of the machine does not depend on his broader idealism, and may even be read as pointing past humanism. Stood on its feet, the same account emerges more recently in STS discussions.

> What is a machine, in fact? A method of reuniting diverse particles of labor which division had separated. Every machine may be defined as a summary of several operations, a simplification of powers, a condensation of labor ... an abridgment of manual labor which multiplies the power of the producer.[24]

Ethically, Proudhon links the machine to an account of liberty which identifies its positive sense with power, and thus the machine as a liberating force. Proudhon celebrates the machine for its potency, linking it to an account of positive liberty as power. Liberty is 'that power which man acquires of using his forces more easily in proportion as he frees himself from the obstacles which originally hindered the exercise thereof'.[25] Negative liberty, freedom from obstacles, is here auxiliary to empowerment. On this reading, power/freedom becomes self-reinforcing even as obstacles to its exercise cease to constrain it. The combination of functions in the machine is an increase in power, and therefore a purveyor of positive liberty. Thus 'man, in inventing a machine, serves his liberty ... because he determines it [not just] because he removes a difficulty from its path'.[26]

Ontologically, however, Proudhon views the machine not as 'merely a productive force' but as a locus in a lattice of forces instantiated by both human and machine agency.[27] Hence his warning against communist proposals for state-managed production:

> Machines do not go all alone: to keep them in motion it is necessary to organize an immense service around them; so that in the end, man creating for himself an amount of work proportional to the number of instruments with which he surrounds himself, the principal consideration in the matter of machinery is much less to divide its products than to see that it is fed.[28]

Here Proudhon most closely anticipates modern concerns with 'the construction of a technical system that involves human beings as operating parts' and the

'reconstruction of social roles and relationships'.[29] His account of machinery's demands is effectively elaborated by referring to what contemporary scholars of STS would call a sociotechnical assemblage. In Proudhon's account, new machinery does not only make some workers redundant, but also brings about new configurations of bodies, machines and their reciprocal agencies. This is a major theme in contemporary STS writings which deploy the Deleuzian concept of assemblage. Although it has more radical ontological implications than Proudhon's idealism could contain, his emphasis on the relationality of machinery places him on the same horizon of meaning with modern discussions of sociotechnical assemblage. Deleuze and Guattari treat assemblages as generic, diagrammatic configurations in and on which forces operate, an abstract but constitutive field-relation of:

> lines of articulation segmentarity, strata and territories; but also lines of flight, movement deterritorialization and destratification. Comparative rates of flow on these lines produce phenomena of relative slowness and viscosity, or, on contrary, of acceleration and rupture. All this, lines and measurable speeds, constitutes an *assemblage*. [30]

In the text, Deleuze and Guattari are discussing assemblage and machines in literary terms to approach a generic ontology, but this ontology has been taken up by STS scholars to discuss *sociotechnical* assemblages, from energy infrastructures,[31] to ubiquitous surveillance,[32] and digital media.[33] This literature draws on the various 'new materialisms' that emphasise distributed agency,[34] an 'unstable cascade' of intentionalities, 'the conjoined effect of a variety of kinds of bodies'.[35] Assemblage theory makes room for 'a general, non-anthropomorphic affectivity within dynamic systems',[36] in which power is distributed among both human and non-living actors. It thus transcends enlightenment humanism and its constructions of agency and subjectivity.[37]

Marx, too, approaches assemblage thinking in his later work. Harvey, contradicting the popular interpretation of Marx as a technological determinist, describes his analysis as bringing together 'mental conceptions, social relations and technologies' in a totality which is not Hegelian but 'more like an ecological totality, what Lefebvre refers to as an "ensemble" or Deleuze as an "assemblage", of moments of coevolving in an open, dialectical manner'.[38] In his later work, Marx would also come to embrace the ontological role of technology, wherein the labour process was seen as 'no longer a singularly or uniquely human process'.[39] As Arthur Bradley explains:

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> If Marx starts out from the neo-Aristotelian position that human species-being makes and uses tools in order to fulfill preconceived ends – this is the species difference between human labour, on the one hand, and the labour of bees or spiders, on the other – he ends up arguing that the tool, in turn, generates new ends – new needs, new instincts, new ideas – that did not pre-exist its use: 'the satisfaction of the first need, *the action of satisfying, and the instrument of satisfaction which has been acquired*, leads to new needs'. (Emphasis added.)[40]

Bradley argues that what remains for a 'Marxian philosophy of technology' to determine, once some kind of human-technology reciprocity is assumed, 'are not the false dualisms of humanism or technocentrism, agency or determinism, cause or effect, and so on but rather what we have called the mutually constituting "between" of the human-tool relation'.[41] For Bradley, this makes Marx the 'original thinker of originary technicity',[42] the notion that no human essence precedes the interaction with technology, or what Bradley describes as 'less a tool or prosthesis that has been super-added *to* life nor even quite a metaphor *for* life but what I will call the empirico-transcendental condition *of* life itself'.[43] This idea that technology – tools, techne, technicity – co-constitutes us from the beginning is prevalent in contemporary studies of technology; typically, however, it is accompanied by a more strident anti-humanism than Marx or Proudhon would have accepted.

The ambivalence prefigured in early socialist works remained present in anarchist discourse throughout the nineteenth century. Thus while Carlo Pisacane, an Italian follower of Proudhon, was 'convinced that railroads, electrical telegraphs, machinery, industrial advances, in short, everything that expands and smoothes the way for trade, is destined inevitably to impoverish the masses',[44] his countryman Carlo Cafiero called for the 'introduction on an immense scale of machines of all kinds' to serve workers, produce a surfeit of necessities, and dispel the notion that socialism was impractical.[45] Similarly, even though Bakunin praised science for positing 'true abstractions which express the general nature and logic of things' and thus foresaw its becoming 'society's collective consciousness', he also warns against its 'claim to the governance of societies',[46] with the social engineering implicit in Comte and Marx. For Stirner, industrial machinery was a powerful metaphor for an authoritarian state of mind:

> Through the State nothing *in common* comes to pass either, as little as one can call a piece of cloth the common work of all the individual parts of a machine; it is rather the work of the whole machine as a unit, *machine work*. In the same style everything is done by the *State machine* too; for it moves the clockwork of the individual minds, none of which follow their own impulse.[47]

Peter Kropotkin, however, most often expressed an optimistic belief in the revolutionary potential of technology, and promoted industrialisation through a 'general education' in 'science and handicraft alike'.[48] In *Fields, Factories and Workshops*, he celebrates the co-evolution of agriculture and industrial manufacturing: 'Agriculture calls manufactures into existence, and manufactures support agricultures. Both are inseparable; and the combination, the integration of both things brings about the grandest results'.[49] He calls for 'more technical education', which will be 'a boon for humanity'.[50] Kropotkin was by no means celebrating hard labour, of course; in his discussion of the 'Paris gardener', Kropotkin describes 'our ambition' to 'produce even more' than the Paris gardener with 'less labour', and to 'enjoy all the joys of human life'.[51] But his understanding of scientific 'progress' is deeply problematic, tinged with the belief that 'the resources of science' are 'inexhaustible'.[52] Kropotkin avowed:

> Whenever a saving of human labour can be obtained by means of a machine, the machine is welcome and will be resorted to; and there is hardly one single branch of industry into which machinery work could not be introduced with great advantage, at least at some of the stages of the manufacture.[53]

As George Woodcock rightly observes, 'Kropotkin's was essentially – and perhaps rather surprisingly – an anthropocentric vision of a developing world'.[54] What Woodcock describes as 'the sharp limitations' of Kropotkin's outlook emerge from modern environmentalists' benefit of hindsight, as the twentieth century witnesses the catastrophic results of peaking resources and sinks. While today most people cannot completely and immediately sever themselves from vast infrastructural assemblages, once aware of the destructive processes involved, their affective relationship with these assemblages becomes at best a sense of unease and at worst an almost suicidal anxiety. Thus, when Bookchin, almost a century after Kropotkin, advocates the embrace of technology to 'reawaken man's sense of dependence upon the environment' by freeing human beings from menial labour, his techno-optimism seems somewhat outdated.[55]

The mid-twentieth century, however, saw many anarchists adopt analyses of technology written by non-anarchist authors including Lewis Mumford, Ivan Illich, and E. F. Schumacher, and address technologies such as the atom bomb, birth control and television, which had qualitatively different scales and capacities for destruction and liberation. As a result, we see a distinct shift in priorities, from the nineteenth century celebration of the productive (and therefore liberatory) capacities of certain industrial technology (matched, of course, with decentralised forms of governance) to the twentieth century call for 'a break with systems of so-called "high technology"'

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and an eco-centric celebration of small, 'convivial', 'intermediate' technologies. John Clark provides a succinct list of characteristics for these more 'appropriate' technological complexes:

> low consumption of resources; utilization of widely dispersed, renewable energy sources; minimal disturbance of ecosystems; human scale; comprehensibility; compatibility with aesthetic values; feasibility of continual reassessment and fundamental redesign in relation to analysis of needs; multifunctionality; capacity to fulfill basic human needs; tendency to reduce artificial scarcities; incompatibility with technocratic and bureaucratic structures; compatibility with democratic control of society, decentralized decision-making, and non-hierarchical social structures; conduciveness to production processes involving enjoyment, creativity, and human development.[56]

This list of desiderata, later echoed by STS pioneer Langdon Winner,[57] is laudable by most measures. Yet a contemporary anarchist politics of technology must consider technological reconstruction without neglecting the legacies of past technologies (the *long durée* of sociotechnical materiality). The material tendencies of our petromodern era ensure that whatever the future holds, it cannot be like the past; there is no linear descent from the peak curve into pristine conditions, no parlour trick to make centuries of ruinous structures evaporate without a trace, no time machine capable of reversing the Columbian Exchange, no space on earth that is exclusive of nuclear contamination, global warming, or the toxic drift of industrial living. Hence, even as we build technosocial assemblages appropriate for life beyond capitalism, we cannot project their proliferation in society as a blueprint onto a blank canvas. Any anarchist politics of technology must contend with a world that is *always already toxic* and in various stages of collapse. A more generative anarchist approach to technology might therefore emphasise experimentation with new conjunctions of humans and nonhuman actors. To ask how both literal and abstract machines connect flows of desire and produce habit-forming potentials takes the matter beyond an ethically-bounded techno-optimism to a plane where analysing *actual relationalities* in the sociotechnical assemblage can aid reconstruction, desertion, and sabotage.

3. INFRASTRUCTURE AND THE PETROMODERN STATE

The modern state form, perhaps more accurately called the 'petromodern' state form because of its dependence on oil for its contemporary shape and capacities, was central to the creation of many modern catastrophes – material tendencies, it

should again be noted, that will inevitably have effects for hundreds, thousands, even millions of years. Timothy Morton has a term for such materialities: he calls them 'hyperobjects', materials that will 'far outlast current social and biological forms'.[58] Morton's hyperobjects are a valuable theoretical provocation in conjunction with Rob Nixon's concept of 'slow violence' – an 'attritional violence',[59] which is 'neither spectacular nor instantaneous, but rather incremental and accretive, its calamitous repercussions playing out across a range of temporal scales'.[60]

The modern state form co-evolved with the material capacities of infrastructure, massive hydraulic processes that could generate and transfer electricity, excavate waste, and couple mobility with communication. 'Between 1880 and 1950 modern nation states emerged as great territorial "containers" with growing powers over many domains', note Stephen Graham and Simon Marvin.[61] Within this context, infrastructure was widely perceived as the cohesive assemblage for a sense of national identity, and 'infrastructure policies were the central way in which national states engaged in shaping capitalist territorial organization'.[62] The proliferation of what Deleuze and Guattari call 'hydraulic science' generated forms of territorialisation that persist to this day,[63] and the contemporary state form now includes engineering megaprojects – such as the Three Gorges Dam in China, the Channel tunnel linking France and the UK, and Boston's 'Big Dig' – that not only consume massive amounts of resources and labour, but also delimit certain escape routes from the project of industrial capitalism. From the emergence of infrastructure to the age of the megaproject, the state form has escalated its material consumption and constriction of mobility and flows. Today, globally, approximately 7.5 billion cubic metres of concrete are produced every year;[64] while most radicals are forming flash mobs and other largely symbolic forms of protest, capitalism is paving over our collective future. While the intrusive digital technologies of the 'control society' attract more attention than the apparent banalities of concrete infrastructure, it is concrete infrastructure that has had a more deleterious ecological impact, and it is crumbling infrastructure in Western capitalist societies that now forms a specific alignment of crisis, neglect, investment, and collapse. Simultaneously, China has engaged in the largest and fastest urbanisation project in the history of the world. As Thomas J. Campanella observes,

> Over the last twenty years, the People's Republic has undergone the greatest period of urban growth and transformation in history. Since the 1980s, China has built more skyscrapers; more office buildings; more shopping malls and hotels; more housing estates and gated communities; more highways, bridges, subways, and tunnels; more public parks, playgrounds, squares, and plazas; more golf

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courses and resorts and theme parks than any other nation on earth – indeed, than probably all other nations combined.[65]

While the modern nation state as an industrialised infrastructural container may have begun in the West, its accelerated and suicidal trajectory is in China. As global ecosystems circle the drain, global state capitalism has its hand on the lever.

In recent years, several excellent studies have articulated the material ways in which the nation state co-evolved with infrastructure projects and explored the material properties of state formation. A brief survey of their work here is intended to foreground otherwise quotidian assemblages that are often forgotten in revolutionary writing and practice.

In discussing the emergence of the 'territorial state' in seventeenth century France, Chandra Mukerji writes that the 'transformation of the French landscape – with the construction of fortresses, factories, garrisons, canals, roads, and port cities – imprinted the political order onto the earth, making it seem almost an extension of the natural order'.[66] Massive infrastructures enabled power to be exercised according to bounded territories instead of centres of power such as towns or cities.[67] This new state form was an engineering achievement as much as it was anything else, and the emphasis for Mukerji is on the material practices of government and not simply state rationalities, which are the emphasis in governmentality studies.[68] Under Louis XIV, 'territorial politics entered the French court, not as a threat to the king, but as a way to associate his legitimacy with the management of the state'.[69] In her recent work, Mukerji examines how the construction of a canal, a piece of infrastructure, 'pointed obliquely toward techniques of governance that lay beyond the visible and familiar practices of domination – war, taxation, and court life'.[70] The building of the Canal du Midi, however, was not simply a triumph of isolated expertise: it 'was a product of a collective intelligence – the work of groups with both formal and vernacular expertise in land measurement, construction, and hydraulics'.[71] Today, the industrial capitalist state claims a similar kind of territorial legitimacy by defining infrastructure in terms of the state's projection of force. 'Critical infrastructure protection' aligns state legitimacy and violence with the necessities of life to such an extent that to oppose the state is to oppose one's own right to clean water, electricity, telecommunications, heat, and so on. Unlike the 'collective intelligence' in Mukerji's example of the Canal du Midi, however, the modern state thrives almost exclusively on formal expertise and the decimation of informal and indigenous knowledges.

Patrick Joyce and Tony Bennett articulate effectively why infrastructure is theoretically compelling:

> Of course, if certain capacities or affordances are 'built-in' to the material world this is very far from dictating outcomes, for these affordances are continually disrupted and transformed through the action of the innumerable other agencies of things and people. Nonetheless, infrastructure is a good location for understanding how material powers can to varying extents operate outside human consciousness and language: indeed, their power lies in this very muteness, this capacity to be left to operate by themselves.[72]

This has implications beyond buildings, electricity and roads. The world of digital media also contains powerful instances of social engineering via mute infrastructures. As Tarleton Gillespie illustrates, contemporary copyright regimes and assemblages such as 'trusted computing' signal a 'fundamental shift in strategy, from regulating the use of technology through law to regulating the design of the technology so as to constrain use'.[73] Increasingly, the affordances and constraints of technological objects constrain their use in more fundamental ways than the law can after the fact of use. 'This is not engineering culture through technology' in some deterministic sense, argues Gillespie, 'but a more heterogeneous effort to regulate through the alignment of political, technical, legal, economic, and cultural elements that must be held in place for a new paradigm of copyright to take hold'.[74]

An important lesson of Gillespie's approach is not only that things have properties that impact the ways in which they can be used, but also that 'builders of these systems also build them in the rhetorical sense, drawing linguistic boundaries around them to indicate what is part of the system and what is not, shaping how the relationship between elements can and will be characterized'.[75] While a company such as Google can promote itself as a benign presence that will not 'be evil', its search engine algorithms dominate the way people interact with the World Wide Web; Google, as Siva Vaidhyanathan writes, 'is the lens through which we view the world'.[76] While Google 'gets information about our habits and predilections', the algorithms that shape so many of our perceptions are 'a black box'.[77] Again, mute infrastructure conditions behaviour. As much as free choice still exists within this architecture, people tend to choose the options it privileges.[78]

The materiality and legacy of particular state-form infrastructures may offer lessons in how to resist particular political assemblages, how to adapt to conditions of collapse, or how to build revolutionary infrastructures. In a study of the impact of centuries of infrastructure policy in Spain, Germà Bel connects eighteenth century infrastructure planning to the centralisation of Spanish governance, a model that was supposed to imitate how Paris was situated within France.[79] The design of postal routes in the nineteenth century in service of the monarchy, for example, 'established a radial network whose characteristics have remained unchanged up to the present'.[80]

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In recent years Spain made connecting all of the provincial capitals with Madrid by high-speed rail 'a national objective', thus becoming 'an extreme example of the use of infrastructure policy in the service of territorial hierarchical structuring and the organization of power in Spain'.[81] Much like the 'heterogeneous' politics described by Gillespie, this infrastructure network in Spain combined 'legal measures, State spending on infrastructures, and running spending on State subsidies for transportation' in a manner that has 'left a permanent imprint on Spanish politics'.[82]

Bel's depiction of Spain is an example of what Jo Guldi calls the 'infrastructure state'. Guldi tells the history of Britain's roads in the nineteenth century, the origins of which date back to 1726 and the military survey of Scotland. 'Rich and poor regions were pitted against one another as new political fault lines opened over issues of access to infrastructure', by 1830 in Scotland, Ireland, and the north of England.[83] The conflict over the design of roads was a conflict over 'the flow of bodies, information, and goods'.[84] The standardisation of toll-booths and sidewalks oriented 'labor and capital to a new centralized management'.[85]

> In the seventeenth century, city-states began organizing their collective wealth around the provision of canals, the first government-built corridors for carrying commodities rather than soldiers. By the nineteenth century, infrastructure had taken the form of state-designed sewers and slum-clearance projects, tools of social as well as civil engineering.[86]

The infrastructure state was built 'around the logic of conquest',[87] and ensured that the paving and management of roads included the application of 'manuals, forms, and bureaucratic hierarchy' in the scrutiny of every component of construction.[88] Such infrastructure ended up pitting 'region against region, experts against the people, and class against class'.[89]

To the examples of France, Spain and England, Patrick Carroll adds Ireland to argue that the modern state is 'by definition' an 'engineering state'.[90] As Carroll puts it, 'modern statecraft is science-based as well as coercion-based'.[91]

> The state-system is the organizational apparatus of governing organizations, from courts, legislatures, and executives to government departments, police organizations, postal systems, census offices, and so on. It is through the state-system that governing *practices materially incorporate* land, bodies, and built environment into the state-country.[92]

What should make this coalition of statecraft and engineering so compelling to anarchists, especially given the ubiquitous toxicity of modern industrial capitalism,

is the way in which it articulates the material pervasiveness of the state form, something Carroll describes as a 'plexus', or 'a dense and minutely interwoven structure of intercommunicating fibers or tissues' through which 'government extends into the plumbing beneath our feet; the food, water, and drugs within our bodies; the roofs above our heads; and the landscape within which we live'.[93]

Again, the significant shift in analytical model for these historians involves an emphasis on practices of government instead of only rationalities of government. Carroll sees his methodology as a 'single triangulated distinction among state discourses, state practices, and state materialities',[94] that transform land, people, and the built environment into 'a socio-technical network of techno-territory, bio-population, and infrastructural jurisdiction'.[95]

These examples of contemporary historians of technology, often working within the methodological concerns of STS, point to analyses of the modern state form and infrastructure unexplored by anarchists. The porous containers of knowledge from which assemblage theory and other ideas emerge, including broad schools of thought such as post-structuralism, autonomous Marxism, post-anarchism, speculative realism, and various 'new materialisms', may cause some anarchists to question their validity for contemporary anti-authoritarian politics. Yet these theories possess many complementarities with anarchist values, and offer generative intellectual force for the revolutionary movement.

Instead of seeing urban spaces, for example, as atomised blocks of petromodern ruins, we could use the concept of assemblage to understand 'the spatially processual, relational and generative nature of the city, where "generative" refers both to the momentum of historical processes and political economies and to the eventful, disruptive, atmospheric, and random juxtapositions that characterize urban space'.[96] Thus, the city becomes 'a place that is not just inhabited but which is produced through that inhabiting', a constitution of urban space that McFarlane calls 'dwelling'.[97]

Urban space in the context of collapse, especially, is invested with fluid potentialities, such as urban gardening, scavenging or squatting, radical orientations to the city that do not privilege assigned neoliberal purposes but rather destabilise those purposes through new forms of 'cofunctioning'.[98] Assemblage theory applied to an anarchist politics of technology suggests, therefore, a more radical ontology than lists of static features of technologies appropriate for a liberated society. It 'implies a greater conceptual openness to the unexpected outcomes of disparate intentions and activities',[99] juxtaposed with expectations of unproblematic social reconstruction with 'appropriate' technologies.

In particular, assemblage thinking emphasises 'the depth and potentiality of sites and actors in terms of their histories, the labour required to produce them, and their

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inevitable capacity to exceed the sum of their connections'.[100] This 'depth', especially in terms of the legacies of technological systems, will be particularly important in the age of collapse, because it offers a better understanding of the materialities and capacities of systems that break down, and open up possibilities of re-use, salvage, and reconstitution which will become all-important under rapidly deteriorating conditions.

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